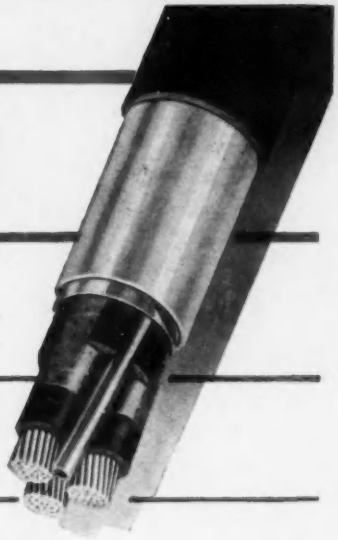
ELECTRICAL TIMES

THURSDAY
16 NOV
1950
SIXPENCE

ALUMINIUM SHEATHED IMPREGNATED PRESSURE CABLES FOR 33kV



BICC have now designed a 33kV 3-core Aluminium Sheathed Impregnated Pressure Cable which is lighter, cheaper, and smaller than the conventional lead sheathed type.

It is economical because the mechanical strength of the aluminium sheath is capable of withstanding the internal gas pressure of 200 lb. per square inch without reinforcement.

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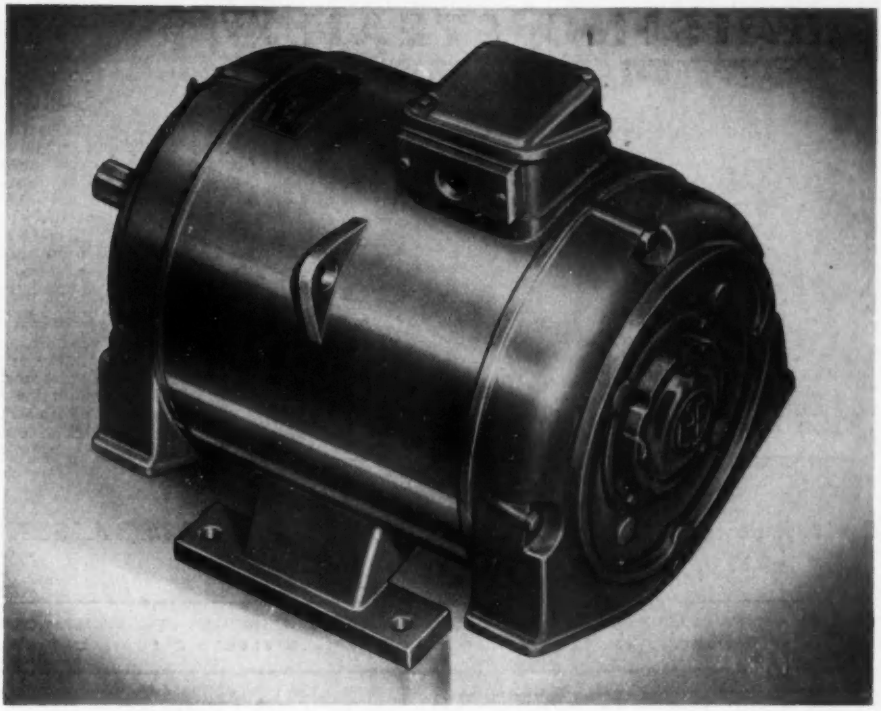

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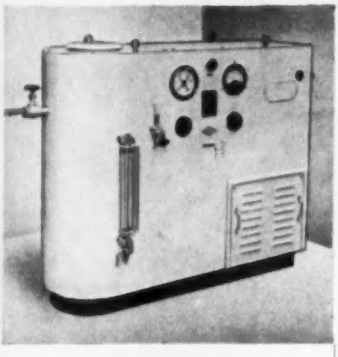

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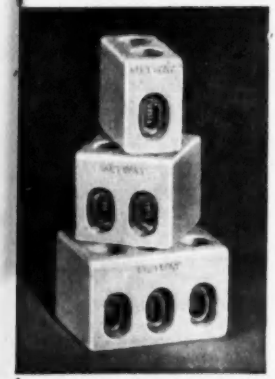

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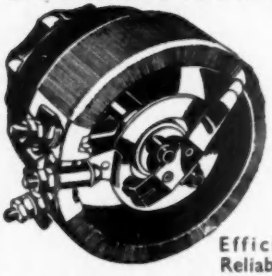

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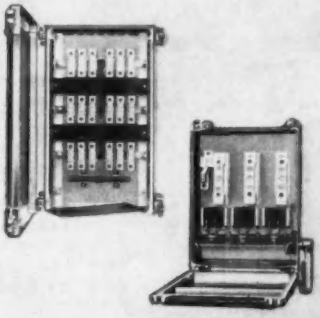

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1912 - 1950

The Story of
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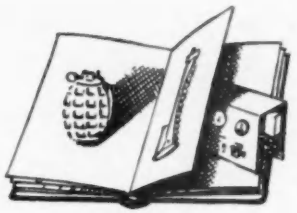
No. 17

(Covering the War Period 1939-1945)



ON THE OUTBREAK of war in 1939, the Works were gradually transferred to the manufacture of stores required for air-raid warning and defence, more particularly in connection with glim lights for use in railway carriages and the direction and other lights required for underground shelters. Also heaters for air-raid shelters were very greatly in demand.

A number of our larger standard cookers were supplied, suitably modified, to be used as baking ovens for armatures and field coils for use in naval establishments, both at home and abroad.

In 1940, our foundry came into the picture by producing hand and rifle grenades, also 3 in. mortar bombs, and production of these was continued, with great success, right until the iron founding industry in the London area was concentrated in 1943. In this year also the Works became A.I.D. approved. In 1941, 2 in. trench mortar sights came in production, and continued until 1944, whilst large quantities of parts for the Sten gun were made, right up to the concentration of production in R.O. factories.

With the intensification of the war effort, tail units for trench mortar bombs were added to our production, and in 1943 and 1944 an enormous quantity of cases, both for radio sets and radar equipment, telescope cases for tanks, and, in short, every possible store for which our Works was suitable.

For Commando raids, a special dimmer signal fitting was made, and such diverse things as radiators and loudspeaker horns, for use on vessels of H.M. Navy, were produced. This, in addition to Hotcupboards for victuals for destroyer crews, etc.

For the R.A.F. in 1943, airfield landing lights and also anchors for power points were produced in large quantities. In preparation for D-Day, during the latter part of 1943 and the early part of 1944, large quantities of ducts for amphibian tanks were made, and also a large contract for multiple rocket guns—these, incidentally, were the heaviest articles this Works has ever produced, weighing just under 8 tons each, which compares with the lightest, a shim which needed 50 to weigh 1 oz.

For the U.S. Air Force, during 1944 and in the early part of 1945, we made no less than 247,000 assemblies for jettison tanks, which enabled many fighter missions to be flown deep into the Continent. The U.S. Authorities were particularly impressed by the collaboration shown, speed of production and willingness to co-operate.

In 1944, also, the R.A.T.O.G. Unit was produced for accelerated take-off for aircraft.

Cabinets for keeping pre-heated food warm were also produced for York aircraft. A very large quantity of glass annealing ovens were made during this year.

Between 1943 and 1945, vast numbers of anti-vibration trays were made for the instruments carried in the modern bomber. In addition, spools for the automatic cameras were produced.

It is impossible to give a full list of every item produced for war service, but such things as screening compartments for preventing interference with radio transmission should be mentioned, also periscope covers for tanks.

The Merchant Navy used large quantities of air warmers of our manufacture throughout the war.

Much research work on light weapons took place in our Experimental Department during the whole war period.

With the end of the war in sight, the Company took a leading position in the production of the "V" cooker for temporary housing.

I think it is interesting to note that prior to D-Day vast stocks of raw materials were accumulated on our spare ground so that there should be no shortage in southern England in the event of transport facilities breaking down during that arduous period.

In summing up our activities during the war, I think I should comment on the extraordinary enthusiasm shown by Works Staff to produce in the shortest possible time the various stores demanded by Government Departments. Their keenness was exceptional and very long hours were the order of the day, yet I do not think anyone felt that it was other than his or her duty. Loyalty to their country impelled them to do their utmost at all times. Obviously, too, at this stage we must remember our employees who joined the Forces, and particularly those who lost their lives, as theirs was the greatest sacrifice of all. Their memory is preserved by a suitable plaque at the Works here.

C. A. Belling

Belling & Co., Ltd., Bridge Works, Enfield, Middx. Tel.: Howard 1212.

ERC17

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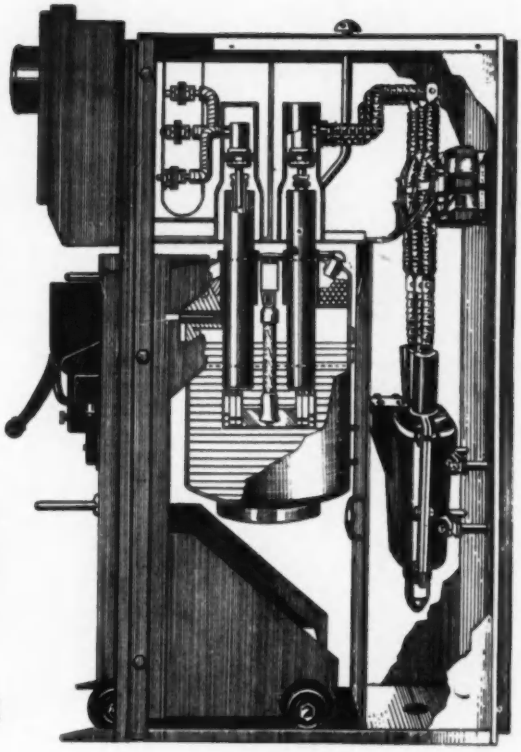

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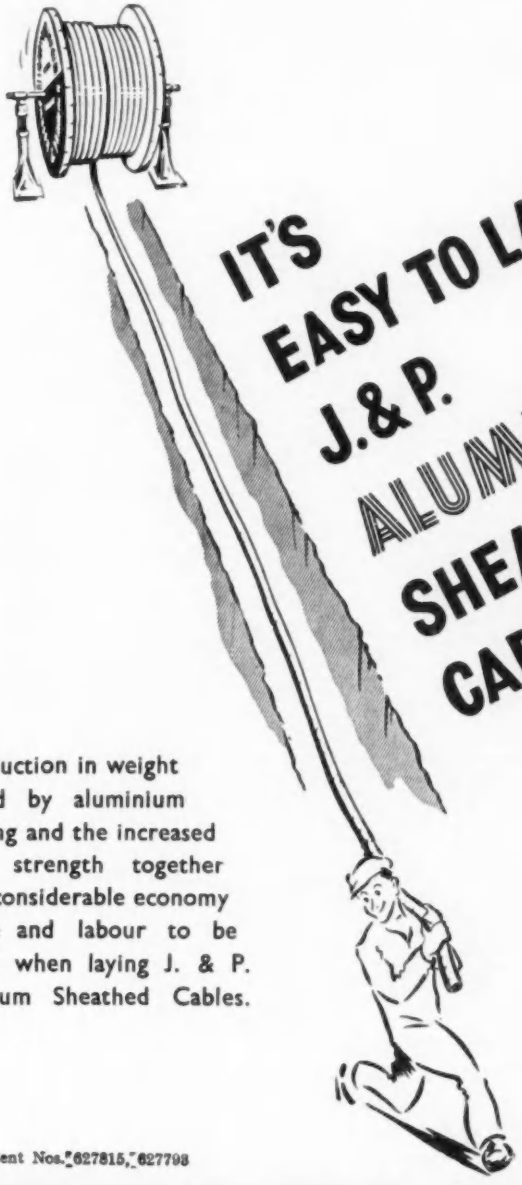

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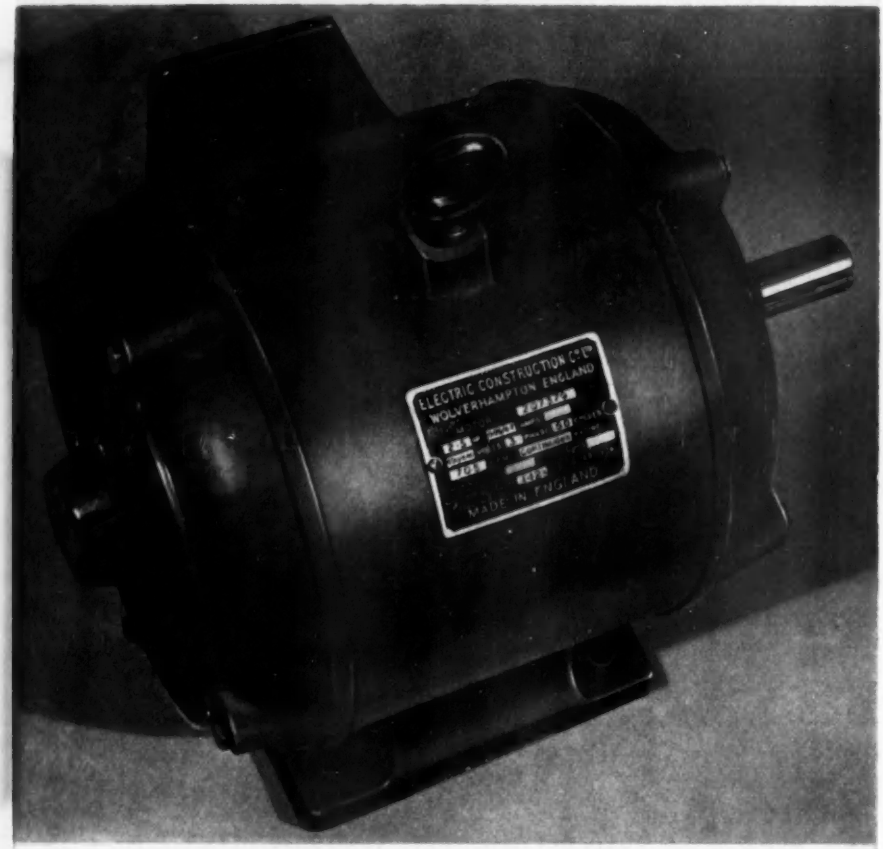

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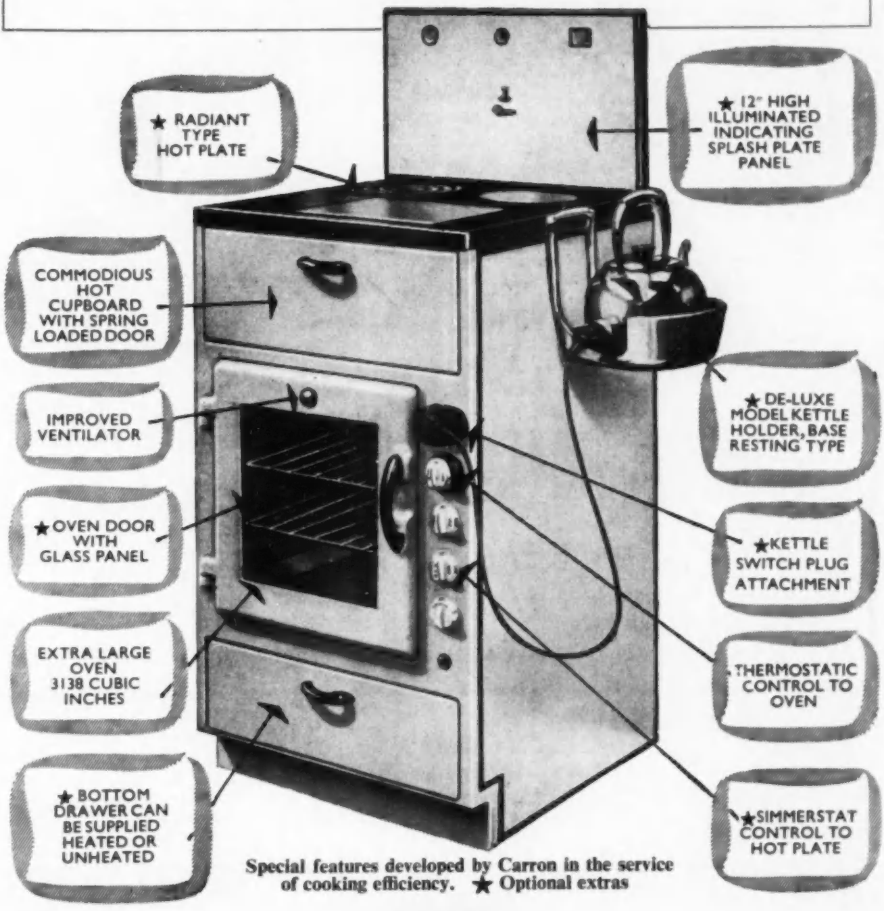
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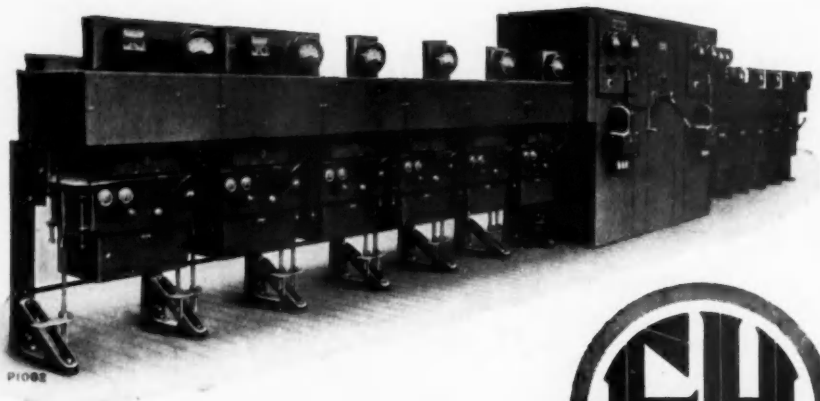

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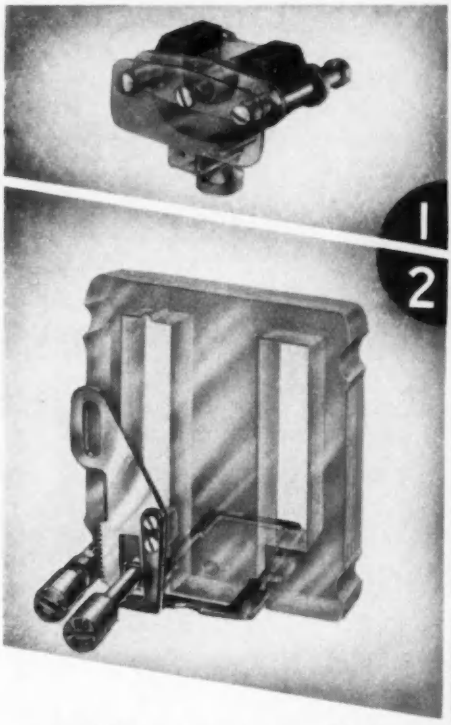
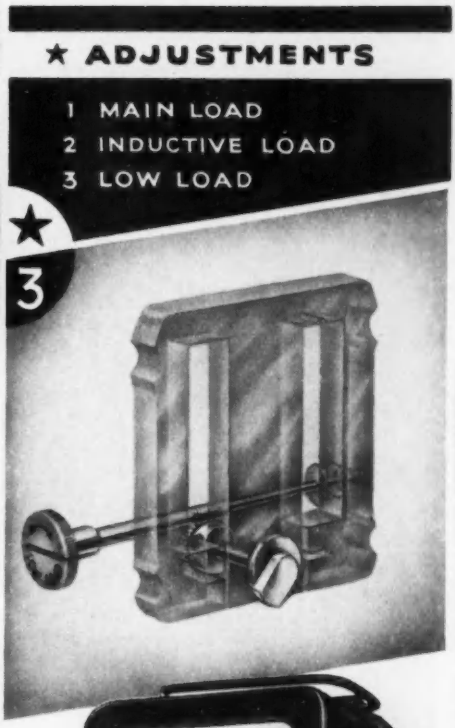


★ ADJUSTMENTS

1 MAIN LOAD
2 INDUCTIVE LOAD
3 LOW LOAD



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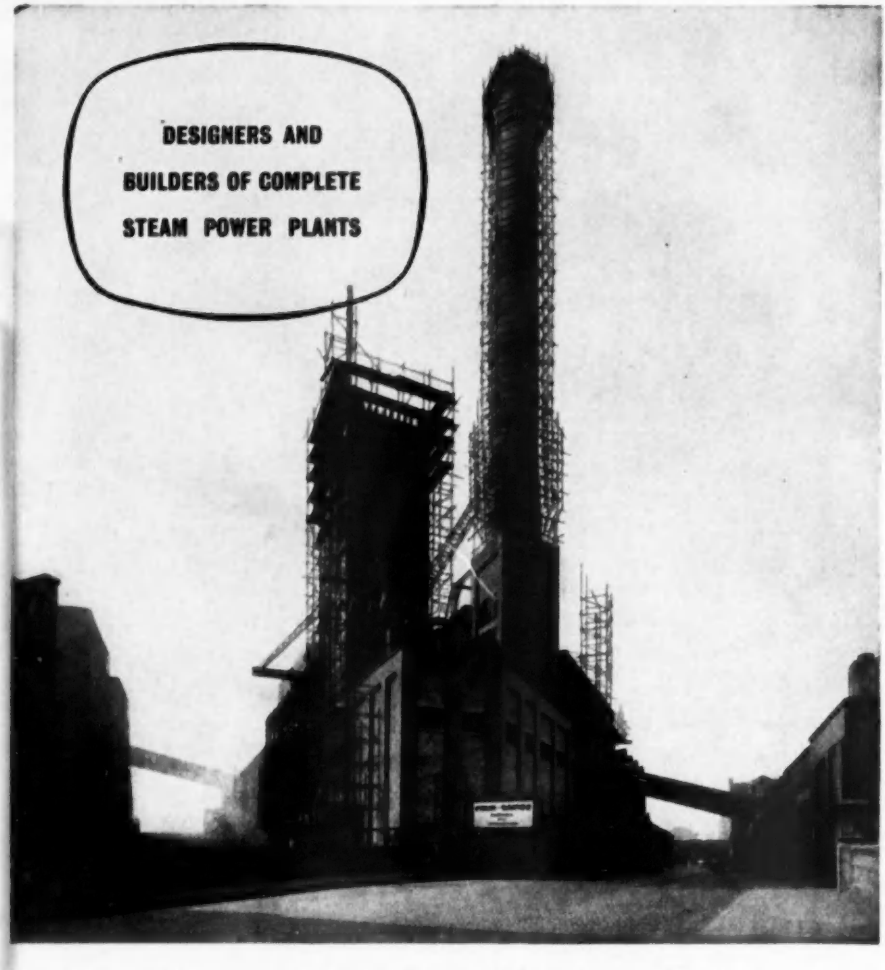

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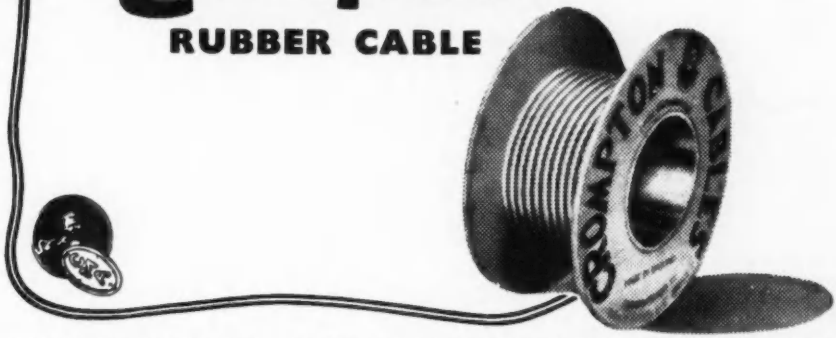

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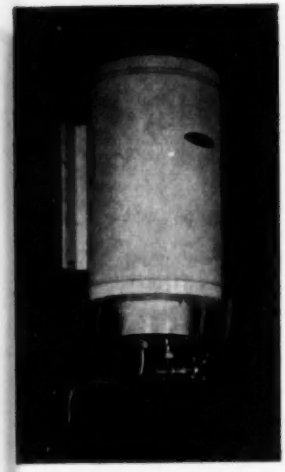

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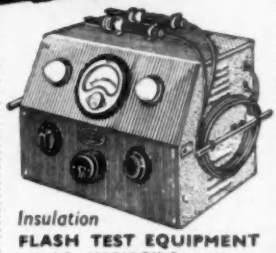

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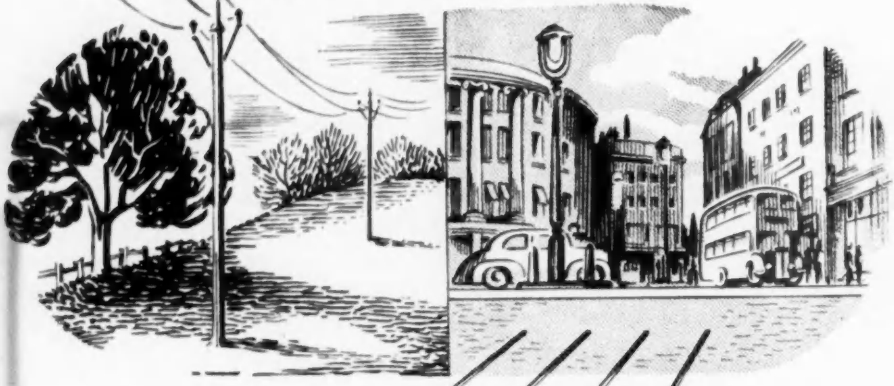

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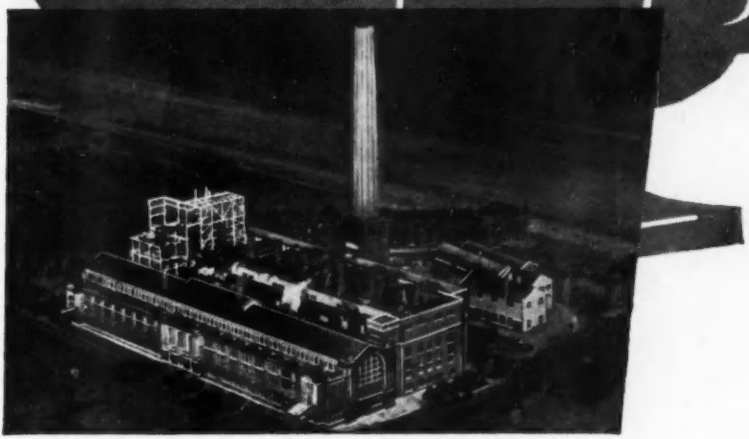


Behind a number of Britain's large scale enterprises lies the quiet efficiency of P & G Batteries. The generation of electricity is a case in point. The Portobello Power Station at Edinburgh (shown here) employs P & G Stationary Batteries for Switchgear Operation, Emergency Lighting and other duties. Portobello is one of many. P & G service extends into many fields and covers complete specifications for any battery installation you care to name, a second and impartial opinion on an existing scheme, the provision of equipment and its installation, regular inspection and report. We welcome discussion on any project on the sound principle that two heads are invariably better than one.

2 *heads are better than* **1**

PRITCHETT & GOLD and EPS Co. Ltd
50 GROSVENOR GARDENS · LONDON · SW1

P&G

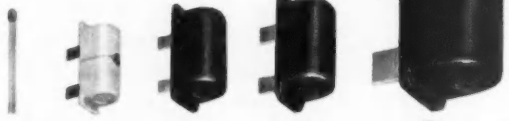
Batteries for Switch Closing, Switch Tripping, Emergency Lighting, Supervisory Control, Telephones, Supply to Auxiliaries

PULLCAP FUSES

of this size would be **Momentous**

Actually they are more significant by virtue of their **minuteness** . . .

Match them



★ RATED AT 5 15 30 60 AMPS
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Over half-a-million housewives

have chosen *Jackson*

'CLEANLINE' ELECTRIC COOKERS

★ There is less to clean in a Jackson

★ Automatic Cookery

★ Simmering Control

★ Largest Hot-cupboard Space

★ Heated Drawer and

★ You can cook more food in a

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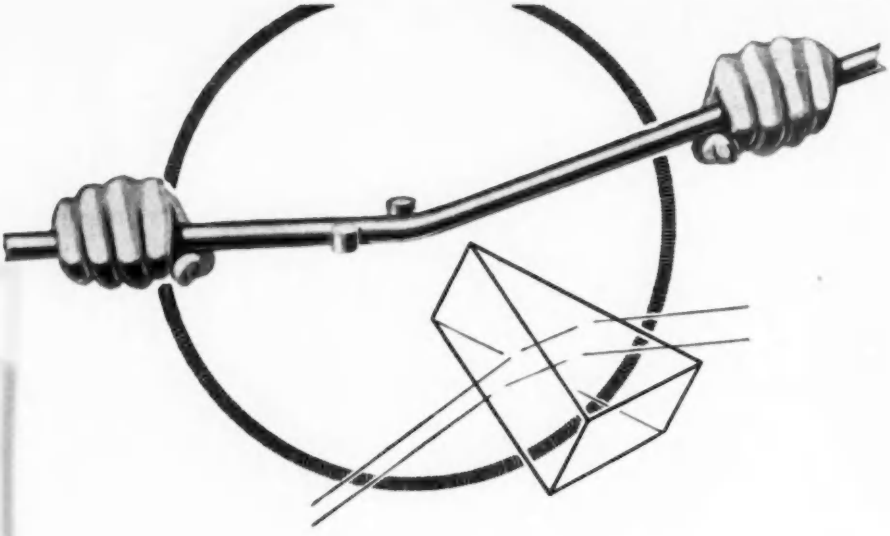
In recommending Jackson Electric Cookers you offer Cookers manufactured by pioneers in the production of electrical cooking equipment, specialists who make nothing but electrical cooking equipment. Because of their extremely low maintenance, all Jackson Cookers are an attractive proposition for Hire Schemes. Fully illustrated literature of all models available from:-

THE JACKSON ELECTRIC STOVE CO. LTD., 143, SLOANE STREET, LONDON, S.W.1. *Telephone* SLOane 6248



The bending of light by transmission or reflection through prisms is the principle employed in providing controlled illumination by Holophane. It ensures that all the available light is directed to the required areas. The principle is embodied in a series of refractors and reflectors covering the requirements of any type of lighting installation.

If you need advice in connection with illumination, the Holophane Technical Service Department will gladly help you.

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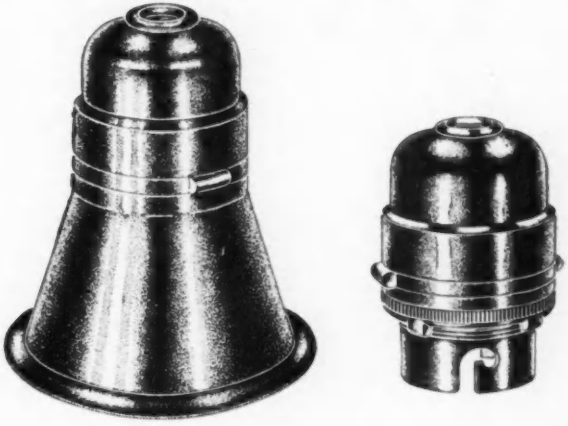
Specialists in Lighting Research and Application since 1896

ELVERTON STREET, LONDON, S.W.1 VICtoria 8062 (4 lines)

"OLD FRIENDS ARE THE BEST FRIENDS"



The "Lincoln" *Lampholder*

A LAMPHOLDER has got to be tough if it is to give a good account of itself, because not only must it stand up to hard—and hot—work, it must also be able to support appreciable weight.

Sixteen years ago we succeeded in building these qualities into the "Lincoln" Lampholder and in evolving novel production methods which enabled us to offer it at a competitive price.

Since that time millions of "Lincoln" Lampholders have gone into service on every type of installation at home and overseas. There is now an insistent demand for the "Lincoln" Lampholder because it has proved itself a stout fellow—the best sort of friend in all circumstances.

CRABTREE

A name synonymous with Progress in Accessories and Switchgear

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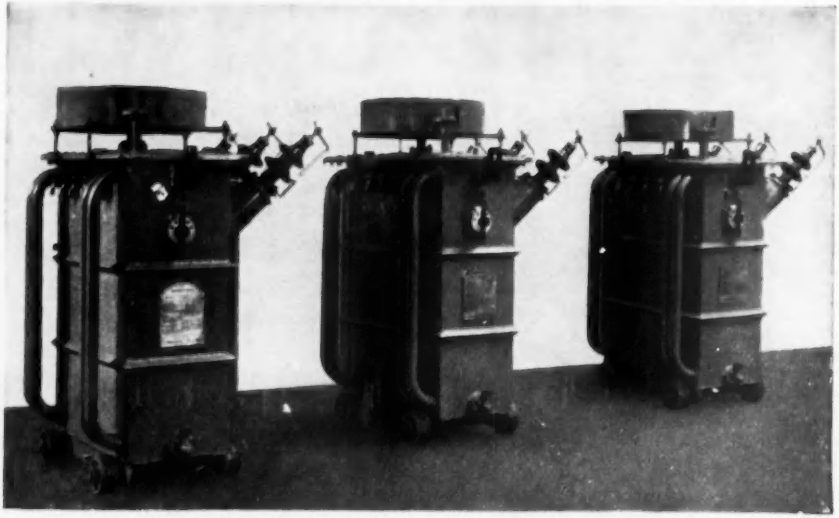
HERMETICALLY SEALED!

Thompson Relief Chamber (Patented)



Part of a Contract for 72-100 KVA Transformers for Southern Rhodesia.

Designed to give

trouble-free service under damp and humid conditions, this type of unit is operating perfectly in India, East and West Africa, Malaya, Ceylon, etc.

NO MOISTURE or ACIDITY of OIL
NO SLUDGING of OIL
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STANDARD TRANSFORMERS UP TO 2,000 KVA ALSO SUPPLIED

Apply for Brochure to—

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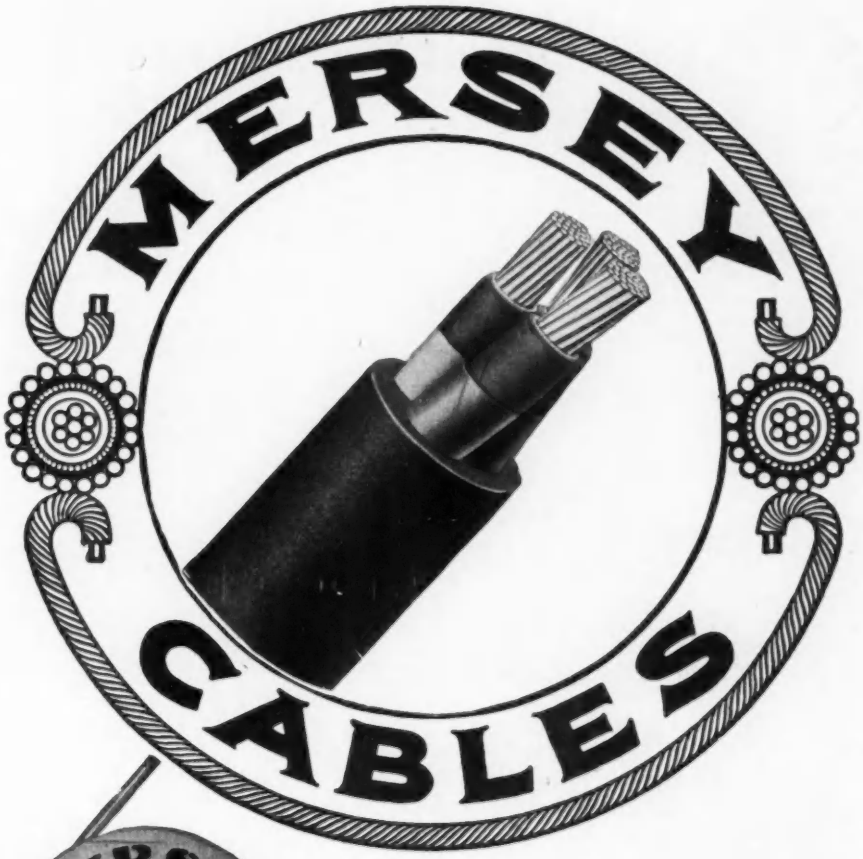

All Sizes of rubber insulated wires, cables and flexibles are made under the famous MERSEY name. *Illustrated is a 19/.064 Three Core Circular V.I.R. Insulated, Taped, Tough Rubber Sheathed 250v. Cable to B.S.— No. 7/1946.*

STOCKED BY SIMPLEX ELECTRIC CO. LTD., AND MANY ELECTRICAL WHOLESALERS

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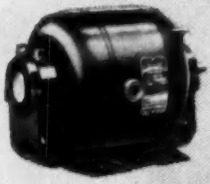
MERSEY CABLE WORKS LTD., BOOTLE, LIVERPOOL. *BOOTLE 2777-8-9*

A TI COMPANY

Fractional Horsepower Motors

Types for every purpose



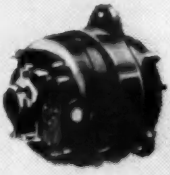
Resilient (left)

Resilient with Belt-tension Adjuster (right)

Low-speed Geared Unit

Spigot (Horizontal)

Spigot (Vertical)



Footless

Ring Mounted

Up to 1 H.P. for A.C. (single or polyphase) and D.C. supply circuits

BTH fractional horsepower motors are second to none in quality and proved performance. All types are available in sizes to meet every domestic, commercial, and industrial need. Precision-built of highest grade components, and fully tested, they will give long and trouble-free service. Little attention is necessary beyond an occasional spot of oil, and this only when sleeve-bearings are preferred to grease-packed ball-bearings. Flameproof motors and slow-speed geared-units also available.

No manufacturer can offer a wider choice in fractional horsepower motors. Whatever the conditions of service or type of drive, there is a BTH motor well suited to the job.

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THE BRITISH THOMSON-HOUSTON CO., LTD., RUGBY, ENGLAND

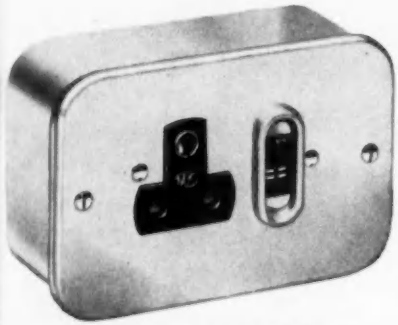
Plinth lighting is rapidly capturing the imagination of the public and there is now an ever increasing demand.

Our latest broadsheet gives Electrical Traders full information respecting R.E.A.L. Plinth lighting and the sales and advertising support associated with the marketing of this new and enchanting form of floral decorative presentation

If you have not yet received your copy of "Plinth Lighting is News" communicate with us and it will be forwarded immediately.

Issued by ROWLANDS ELECTRICAL ACCESSORIES LTD., R.E.A.L. WORKS, BIRMINGHAM 18

M.K. METALCLAD SWITCHSOCKET-OUTLETS



Introducing a new range of metalclad switchsocket-outlets and plugs of remarkable value. They incorporate the latest type of A.C. switches, shuttered sockets, and are mounted in pressed steel boxes. Leading features include A.C. type switches incorporating pure silver contacts. Simple and reliable shutters with snap action. Boxes made in one piece from zinc-coated steel, bonderized and finished aluminium. Four ¾" knockouts, one on each side. Front plates — protected type, aluminium finish. Domestic type, brass, finished matt bronze. Bases, urea moulding of non-tracking type.

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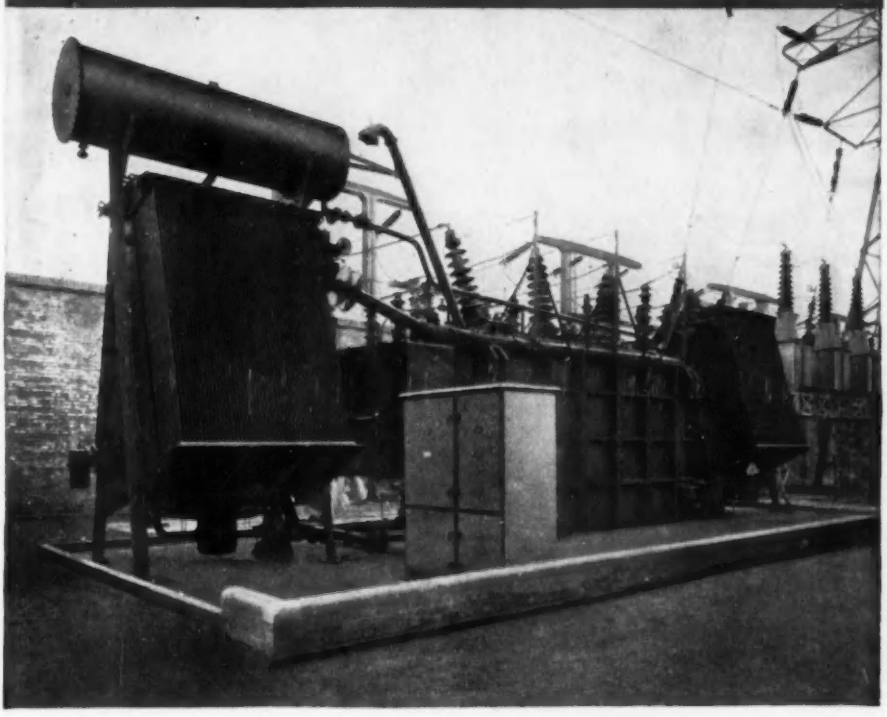
TRANSFORMERS

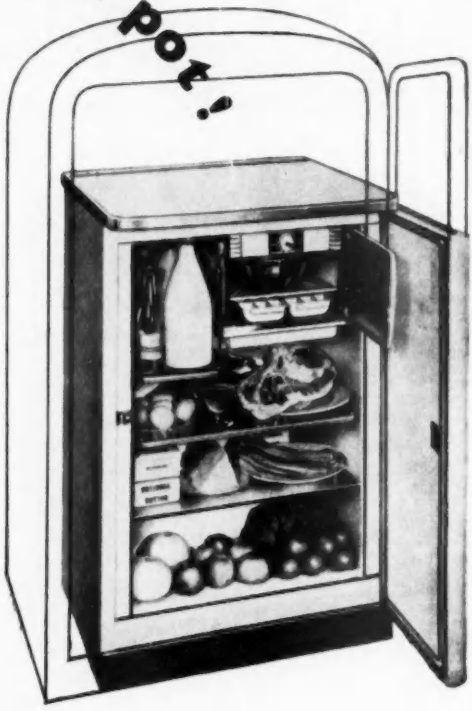


A 45,000 kVA, 132/33 kV transformer, fitted with 132 kV on-load tap changer, at the Newport outdoor substation of the B.E.A.

by G.E.C.

THE GENERAL ELECTRIC CO. LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C.2

A quart in a pint pot!



Your customers will be as pleased as we are about the new Coldrator C.T.45. Here is a full 4½ cu. ft. Domestic Refrigerator that stands only as high as a table . . . yet holds just as much as ordinary models twice as bulky

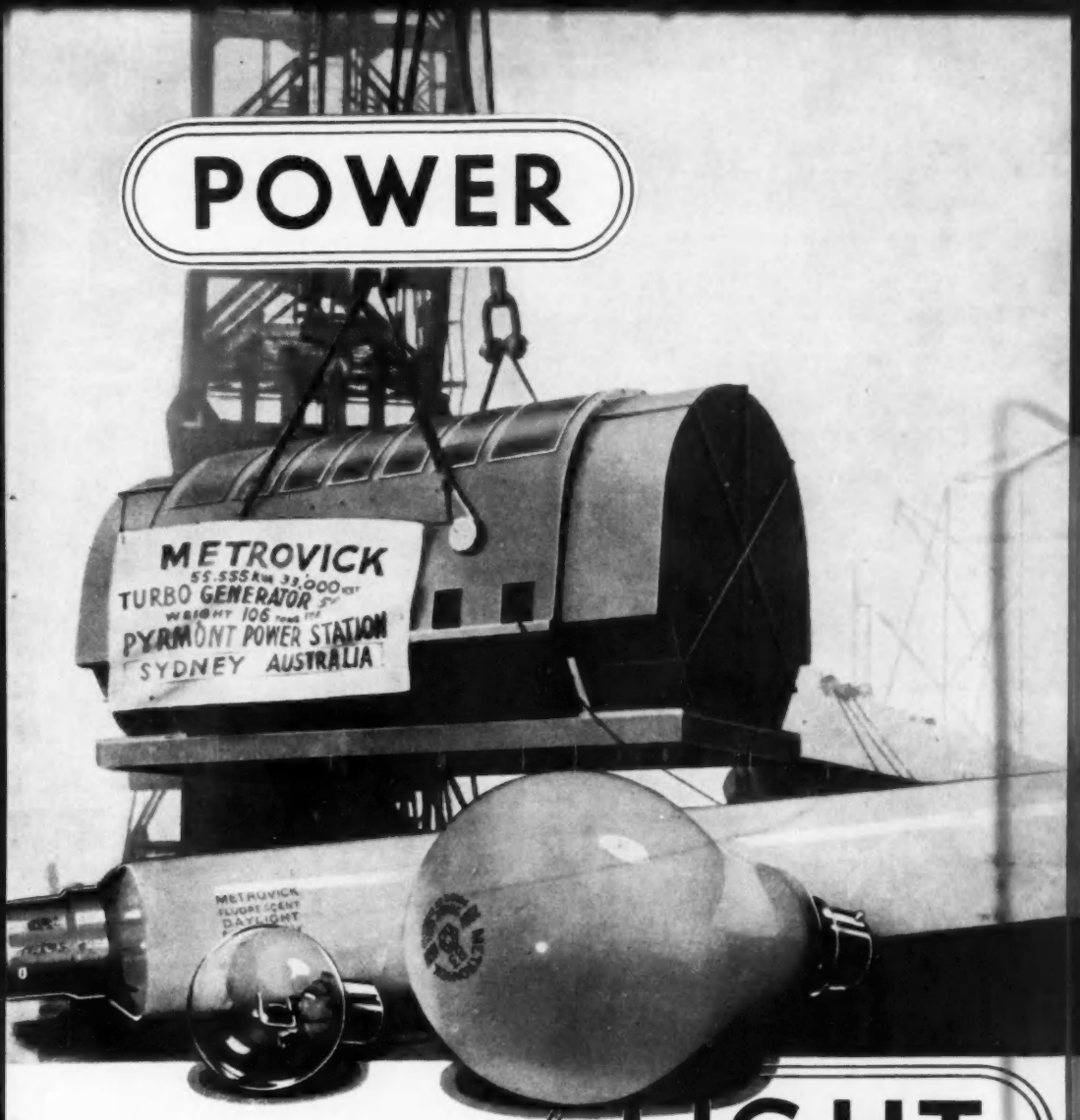
From top to bottom every inch has been utilized to provide nearly nine square feet of shelf space. Even the small whisper-quiet B.T.H.-designed Sealed System is positioned to give more room. All moving parts are sealed in steel away from air, dirt and moisture; no periodical inspection or oiling is needed, and **this system is guaranteed for 5 years**

COLDRATOR
C.T.45

INTERNATIONAL REFRIGERATOR CO LTD

Stanhope House Kean Street W.C.2 & Llandudno Junction

Member of the AEI Group of Companies



Metrovick Turbo-Generators are famous for reliability all over the world. Here is one of 55,555 kVA being shipped to Australia. Millions of people depend on Metrovick equipment for their electricity.
You are assured of that same reliability of service when you buy

METROVICK LAMPS

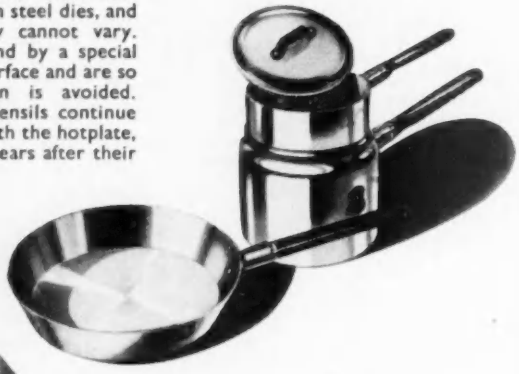
METROPOLITAN-VICKERS ELECTRICAL CO. LTD.

ST. PAUL'S CORNER, 1-3, ST. PAUL'S CHURCHYARD, LONDON E.C.4.

Member of the A.E.I. group of companies

Cost A LITTLE MORE *Last* A LOT LONGER

It is true that PYRAMID cost a little more than ordinary aluminium utensils, but then, there never was anything quite the equal of PYRAMID aluminium ware for hotplate cooking. PYRAMID utensils are specially manufactured with quarter inch thick bottoms; they are solid drawn in steel dies, and their thickness and quality cannot vary. They are scientifically ground by a special process to give a dead flat surface and are so constructed that distortion is avoided. Consequently, PYRAMID utensils continue to give "all over" contact with the hotplate, and so save electricity, for years after their cost has been forgotten



PYRAMID

ALUMINIUM WARE

HAGUE & McKENZIE LTD., PYRAMID WORKS, BIRMINGHAM 1

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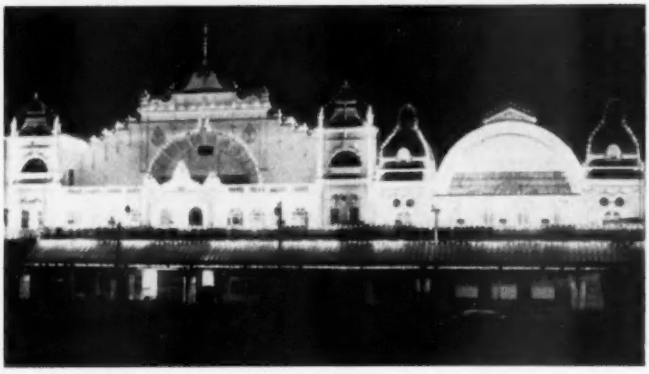
a Brilliant Success



Claimed to be 'Britain's most artistic illuminations', Morecambe's 1949 scheme was a brilliant success. Among privately illuminated buildings, the Winter Gardens secured first prize.

The installation was wired throughout with ST. HELENS T.R.S. and V.I.R. taped and braided cable by the Winter Gardens' own electrical staff. For dependable service under all conditions, always specify—

ST. HELENS CABLES

ST. HELENS CABLE & RUBBER CO. LTD., SLOUGH Telephone: SLOUGH 20333

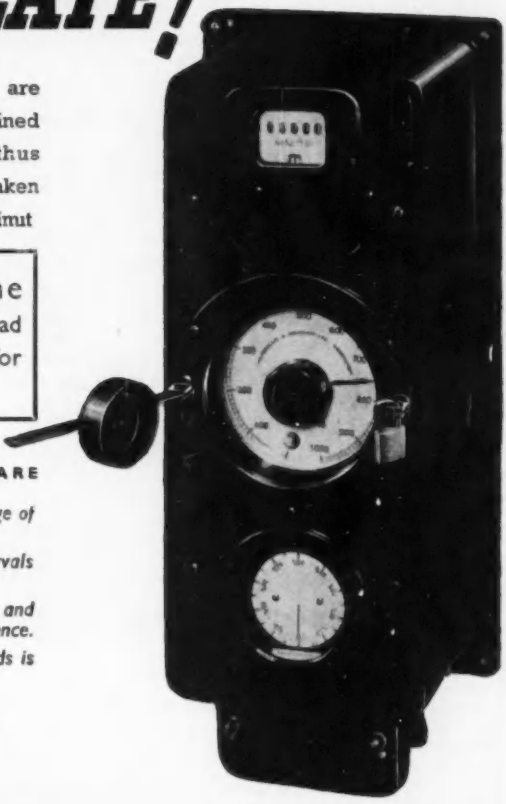
A PEAK LOAD WARNING

that is

NOT TOO LATE!

Visible and audible warnings are given BEFORE a predetermined target load is exceeded, thus enabling effective action to be taken to reduce the load to the desired limit

NOW is the time to install a C & H Peak Load Supervisor. Do not wait for the winter!



THE MAIN ADVANTAGES ARE

Immediate indications of the percentage of total load to be shed on warning.

Warnings are repeated at 5 minute intervals until load is adequately reduced.

Target load setting easily adjustable and protected against unauthorized interference.

Duration in minutes of any excess loads is automatically registered.

WRITE FOR CATALOGUE SECTION P.L.I.

C & H

PEAK LOAD SUPERVISOR

Manufactured by

CHAMBERLAIN & HOOKHAM LTD.
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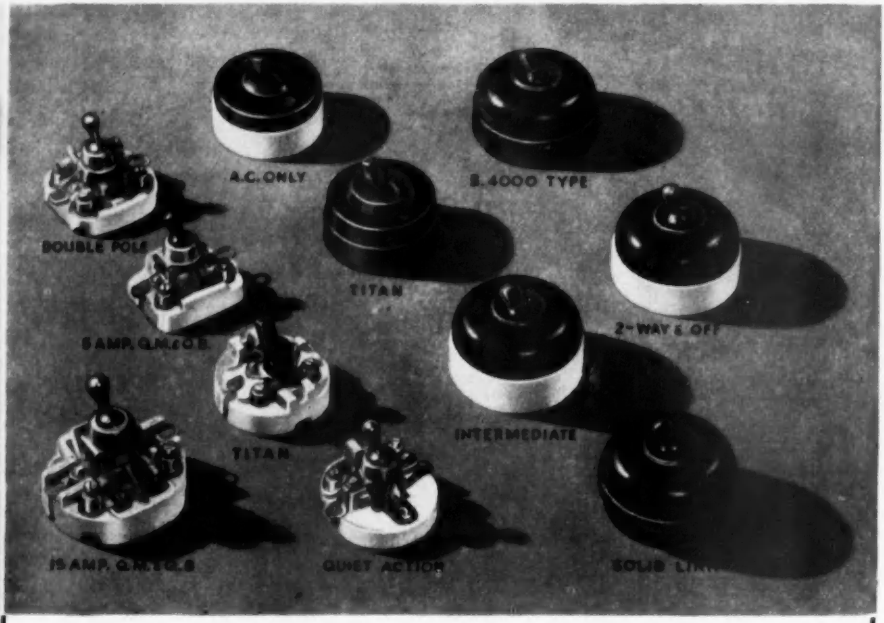
Tucker SWITCHES

meet exacting installation requirements



The famous B 4000 type 5 and 15 amp. S.P. and D.P. range is installed with every confidence for circuits where heavy current loads may occur. Hospitals and locations where quietude is essential demand the B424 QUIET-ACTION lighting switch. Diminutive dimensions and colossal capabilities are combined in the attractive Titan pattern. To complete the selection; for A.C. only requirements, the B66 type with slow break embodies the accumulated experience of 15 years pioneering research.

Tucker TELAC

J. H. TUCKER & Co. Ltd., Kings Rd., Tyseley, Birmingham 11

***London Office*: 2 Newman Street, W.1**

Makers of First-Grade Electrical Accessories for 57 years

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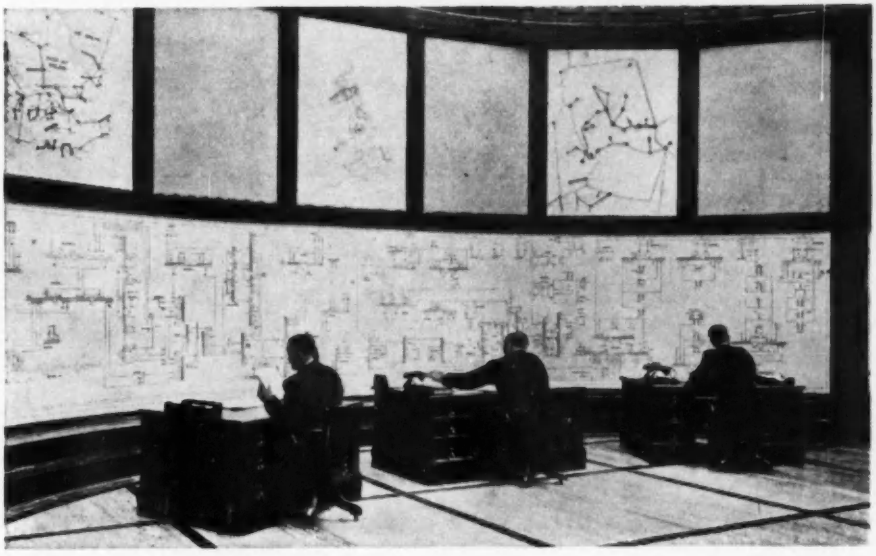
Agents in Shanghai: China Engineers Ltd., P.O. Box 1182, 88 Museum Road, SHANGHAI

Visual indication of vital information



Constant visual indication provided by A.T.M. Supervisory Remote Indication and Control Equipment gives the controlling engineer all the information necessary for the supervision and operation of the entire plant in a network.

Distances over which the equipment will operate are practically without limit. Many different conditions may be controlled and indicated over a single pair of wires.

May we send you further information?

Some of the facilities provided for the controlling engineer in an Electricity Supply Undertaking equipped with A.T.M. Remote Control Equipment include: starting and stopping of machines, closing and tripping of circuit breakers, raising or lowering of voltages by transformer tap change gear, inter-tripping of circuit breakers in grid networks, warning signals of fault conditions in unattended local sub-stations, telemetering (for total station load, busbar, volt and feeder amps), etc.

ATM supervisory remote indication and control equipment

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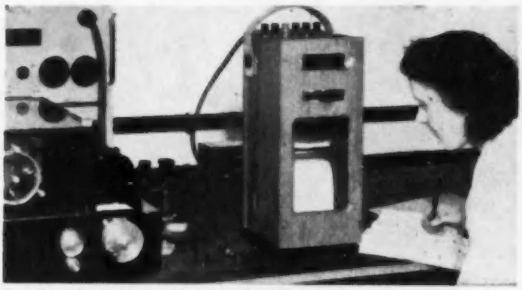
Eversheds Roll Chart Recorders aid development and research



Eversheds Recorder used in conjunction with an Infra-red spectrometer, manufactured by Sir Howard Grubb, Parsons and Company, Newcastle-on-Tyne.

Astronomy, Plant Disease and Radio Waves

Although Eversheds Roll Chart Recorders are more widely known for their uses in factories, workshops and power stations, they have interesting functions in the fields of development and research.

In one research establishment, for instance, an Eversheds Recorder is used in connection with the development and production of Geiger Counters. For each counter a plot has to be made of the plateau characteristic, which is a feature of the curve "rate of count/applied voltage". With the use of an Eversheds Recorder the complete plateau curve is plotted automatically over a period of about 10 to 15 minutes, depending on the length of the plateau.

Automatic recording, compared with point-by-point plotting, reduces the effect of statistical variation inherent in radio-active disintegration, and of course effects a saving in man-hours.

The Scottish Raspberry Investigation at University College, Dundee, employed Eversheds Recorders to help determine the association between light intensity and the expression of disease symptoms in virus infected raspberries. Fluctuations in incident light were detected by selenium cells, their current being amplified and recorded, it being reported that the Eversheds Recorders showed themselves remarkably sensitive to very slight variations.

In work carried out for the Signals Research and Development Establishment of the Ministry of Supply, Eversheds Recorders have been employed in experiments on the propagation of very short radio waves. The instruments were employed to make automatic records of signal strengths at receiving stations for periods of between two and three years.

The University of Cambridge Department of Physics, at the Cavendish Laboratory also uses Eversheds Recorders to record the intensity of radio waves — this time emitted from the sun and the stars. Records are also being made of the propagation of radio waves of long and very long wavelengths, and the results are being applied to a study of the electrical properties of the earth's upper atmosphere.

● *For details of Eversheds Roll Chart Recorders, send for Publication J. 222*

Eversheds Recorder an "Invaluable Asset"

An Eversheds Recorder is used in a Sub-Area of the National Coal Board for checking the loading of cables and switchgear. Every cable in the distribution system is examined twice a year and a study of the recorder charts reveals any increases in load which might exceed the capacity of the apparatus, and enables appropriate action to be taken.

Recordings were recently taken on an electric winder operating on sinking duty which, being unbalanced work, made an interesting study and even pointed out the differences in operation of the men working the winder.

"Generally speaking", says the Sub-Area Chief Electrical Engineer, "we regard the Eversheds Recorder as an invaluable asset, and an essential part of our equipment."

For details of Eversheds Recorders, send for Publication J 222

New—The 'Noflote' Control Story

Eversheds have produced a new edition of the 'Noflote' Pump Control Booklet. This contains, for the first time, complete details of the new sensitive pattern relay units, which are used for operation in connection with relatively clean water. The standard pattern electrodes used for drainage and sewage purposes are also described. *Send for your copy—Publication J. 234.*

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PROCESS CONTROLLERS
INDICATORS & RECORDERS
REMOTE CONTROLLERS
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EVERSHED & VIGNOLES LTD *ACTON LANE WORKS, CHISWICK, LONDON, W4*
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ELECTRIC FIRES

MODERN • EFFICIENT • ARTISTIC

Insist on ANGELUS and have the benefit of our fifty years experience and our excellent service.

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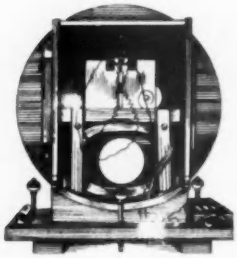
John Wilkes have been making Copper and Brass since the days of

Professor W. E. Ayrton

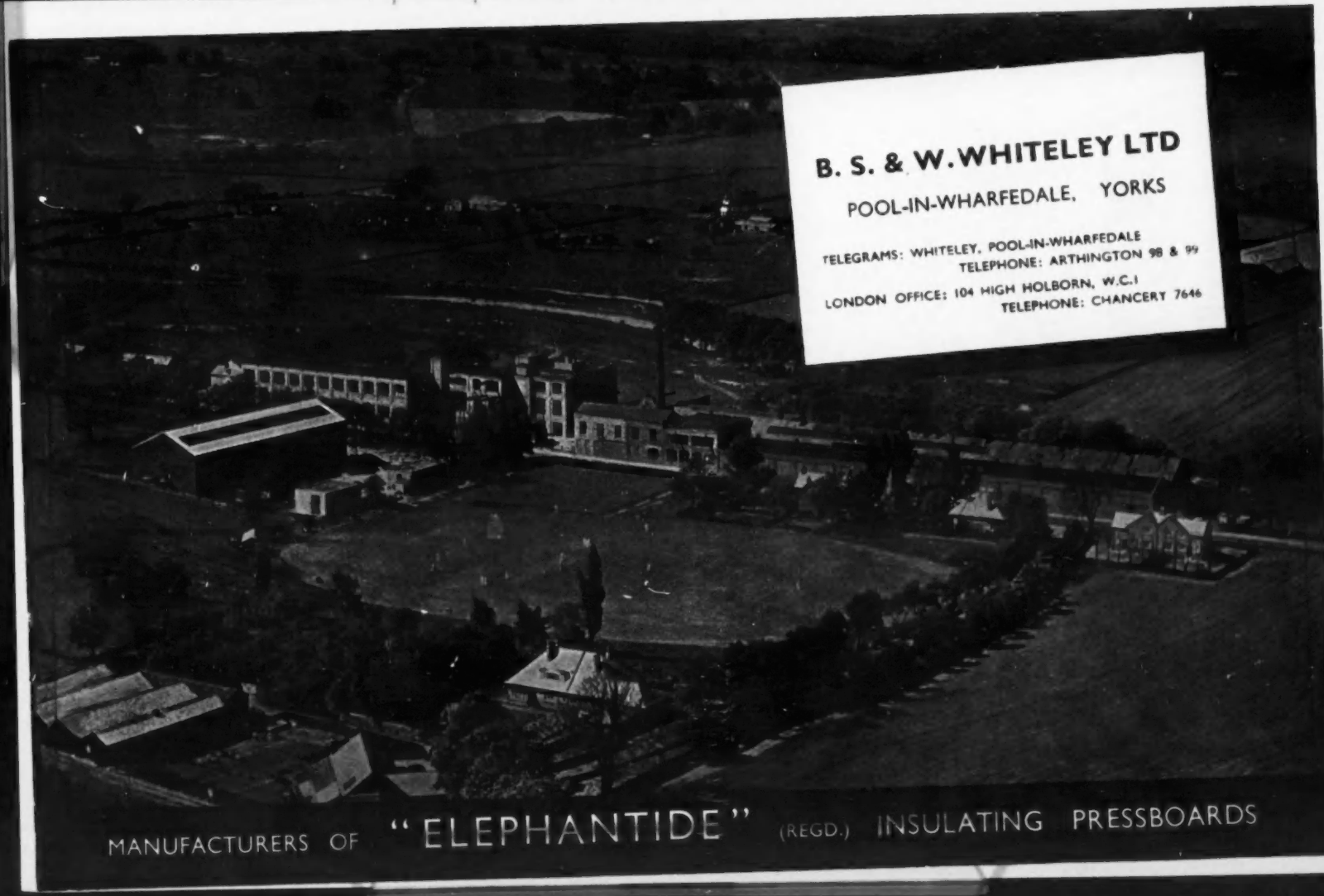


Besides being a distinguished physicist, Professor W. E. Ayrton of London took a leading part in the development of electrical measuring instruments. Fortunately even in those early days of the industry, such brilliant inventors were not hampered by any lack of materials. Among the firms supplying high quality copper wire and bar was that of John Wilkes.

The Ayrton & Perry Clock Meter, made in 1882. Originally named an "ergmeter," it comprised a spring-driven clock with a pendulum carrying a moving coil. The amount it gained on an ordinary clock measured the watt-hours.

Today, John Wilkes, Sons & Mapplebeck Ltd. maintain the same high quality, and their products are widely used throughout the electrical trade.

JOHN WILKES, SONS & MAPPLEBECK LIMITED, Birmingham 18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The MECHANICAL CHARWOMAN *Makes News!*

Christened "The Mechanical Charwoman" and enthusiastically welcomed by the *Daily Telegraph*, this brilliant new machine first made news at this year's Ideal Home Exhibition.
To "steal the show" at its first public appearance, and afterwards to capture the imagination of the national Press in no uncertain manner, is, indeed, an exceptional achievement.
"The Mechanical Charwoman" is the only machine of its kind in the world, doing five cleaning jobs, for housewives, offices, shops, restaurants, hospitals, hotels and similar establishments.
"The Mechanical Charwoman" is news indeed. Good news for people with cleaning problems, and that means almost everybody. Good news for you if you are a Columbus agent or about to become one.
COLUMBUS
The Mechanical Charwoman
ONE MACHINE with interchangeable units for Scrubbing, Drying, Suction Polishing and Cleaning of all floors and floor coverings, and for Dusting from floor to ceiling.
PRICES from £32 10. 0. to £58
(plus Purchase Tax), according to requirements.
Individual appliances to do all these jobs would cost around £200. Few of your customers could afford that, but many will be in the market for the "Mechanical Charwoman."
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COLUMBUS LTD., WEMBLEY, MIDDLESEX

Specialist Manufacturers of Floor Maintenance Equipment for Industry and the Home.

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are you prepared?
ELECTRIC IDEAS for Christmas presents
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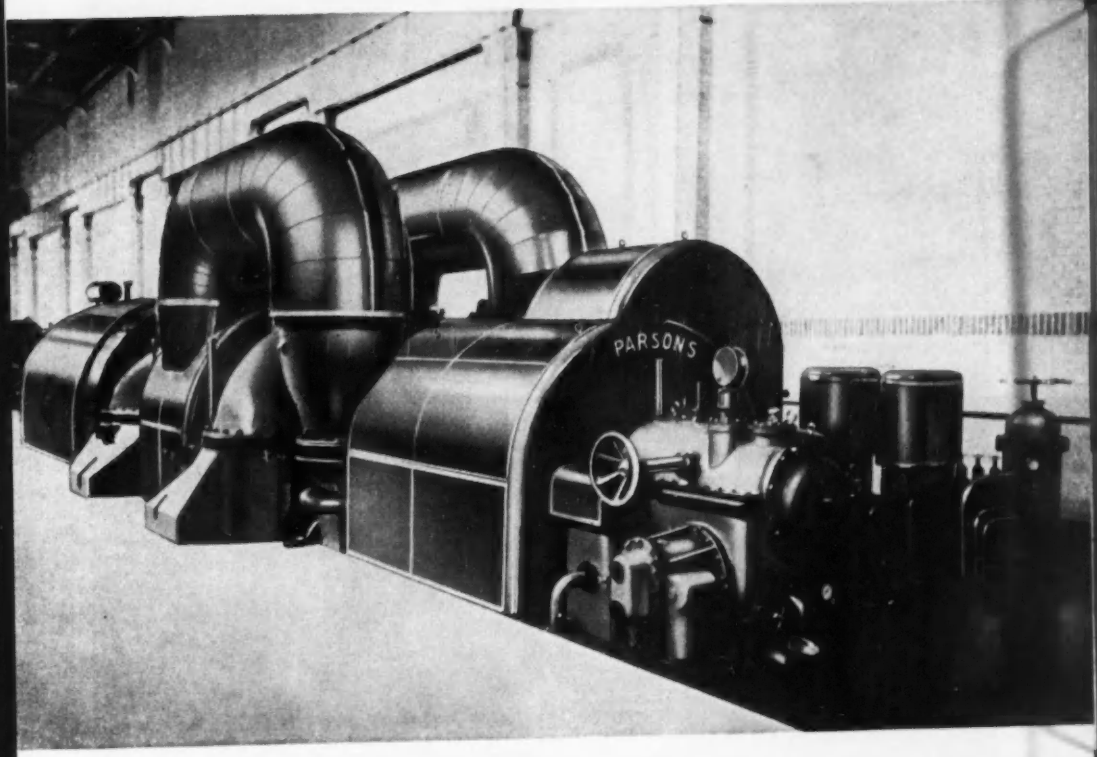

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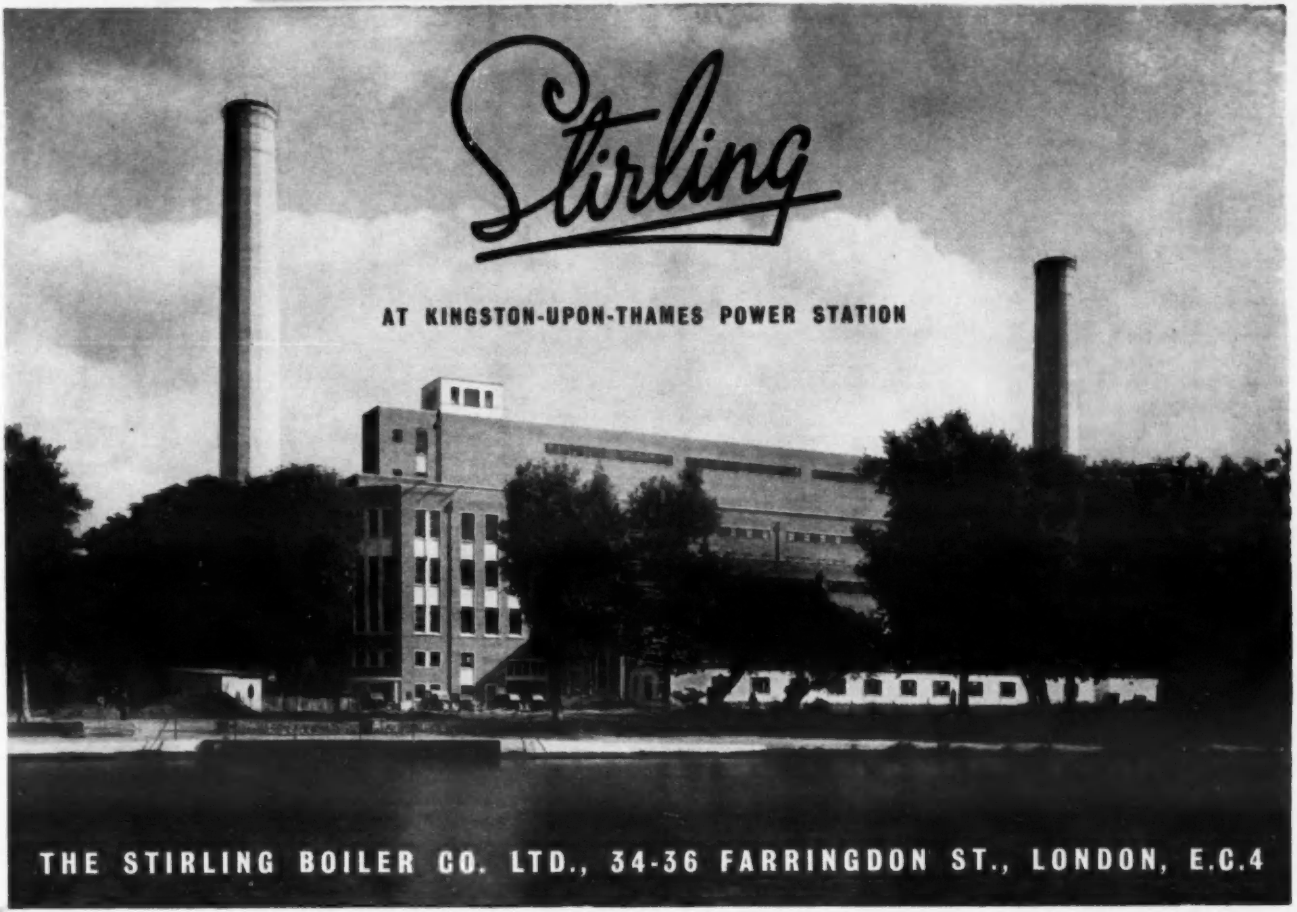
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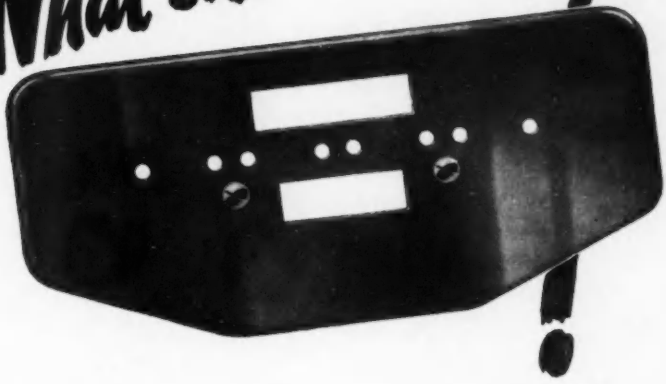

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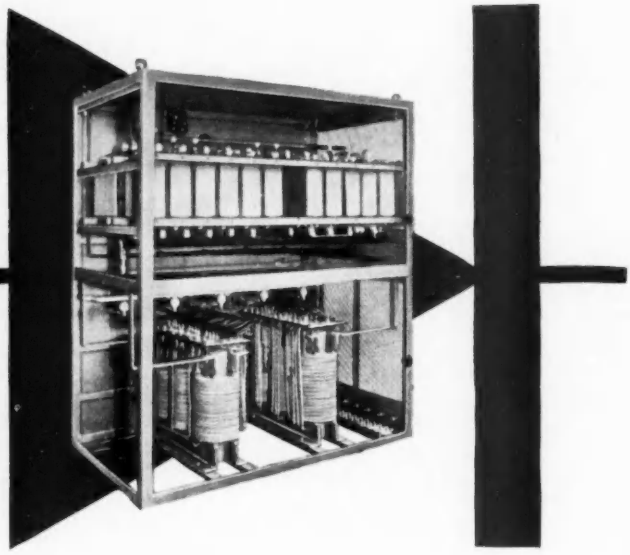

Top illustration: Portable Battery Charger
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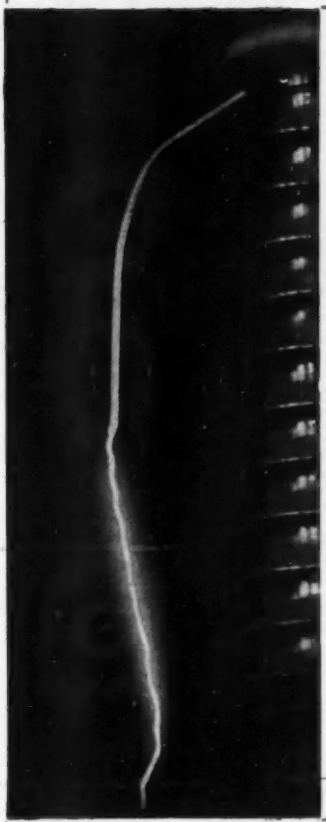
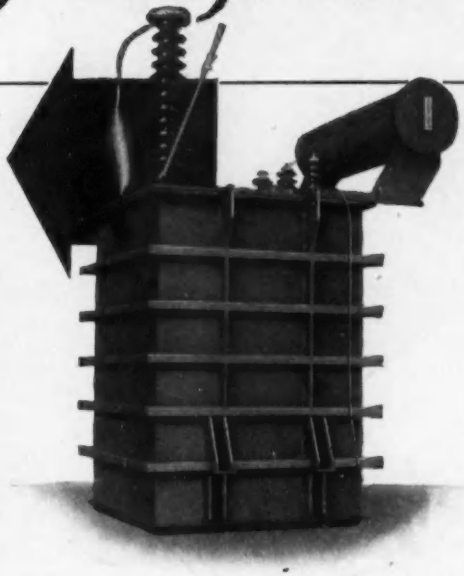
talking of transformers-





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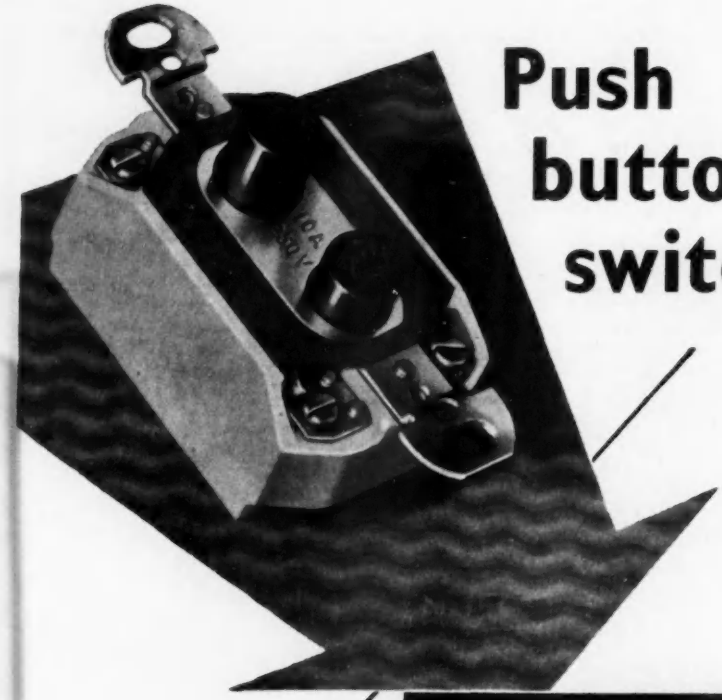

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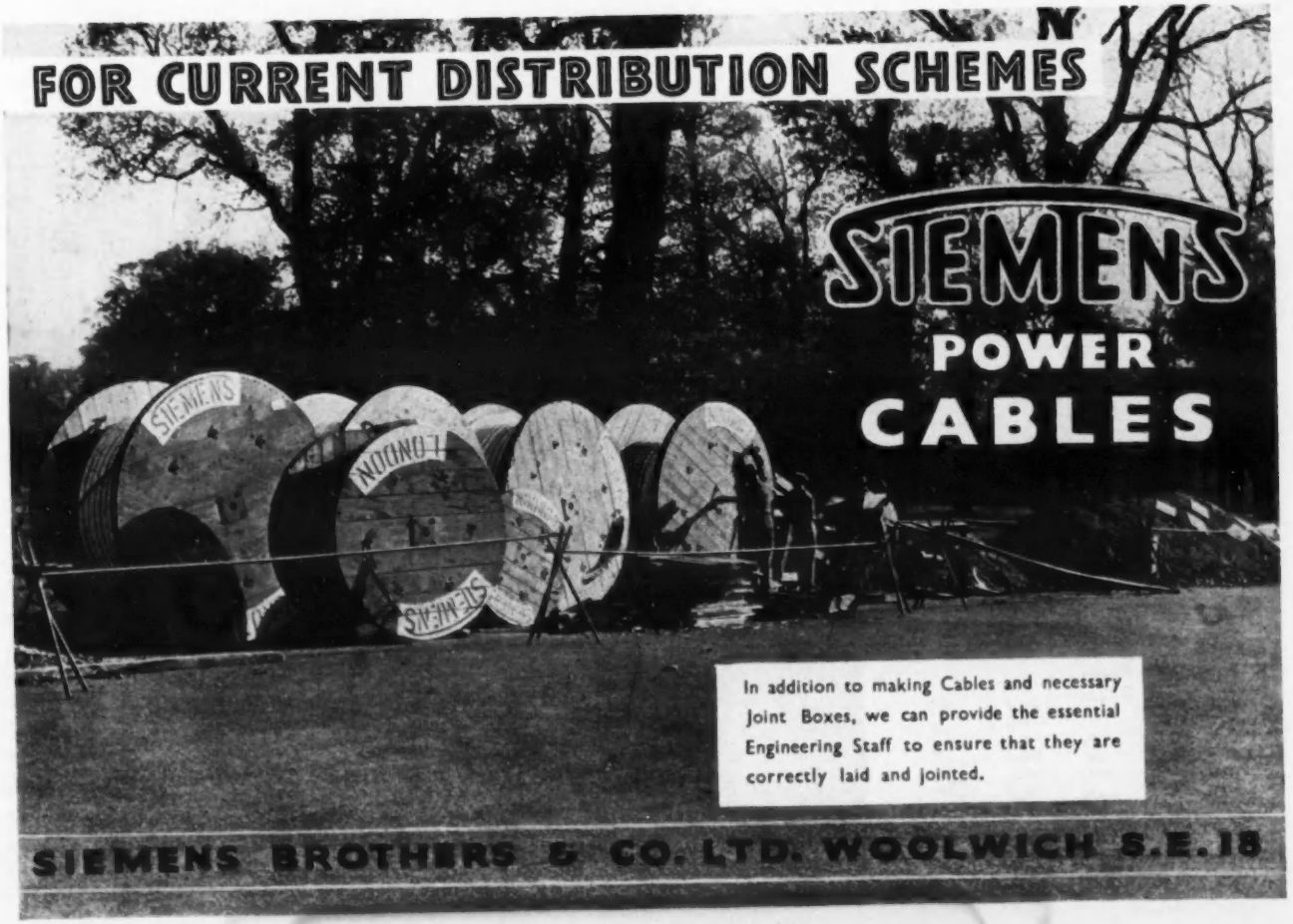
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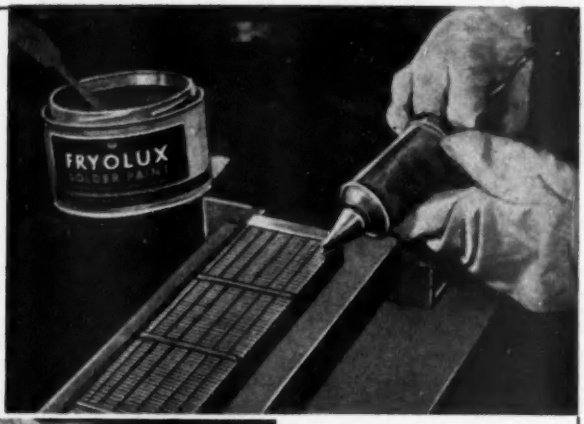

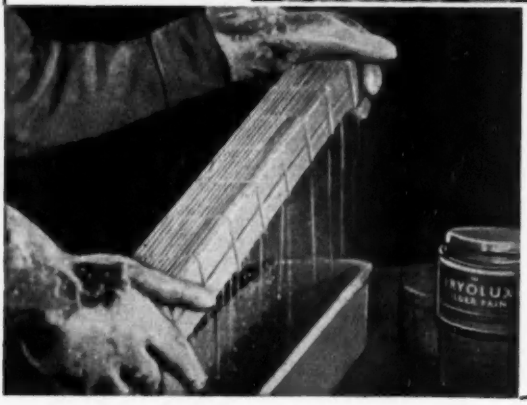

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ELECTRICAL TIMES

Vol. 118 No. 3080 THURSDAY, 16 NOVEMBER, 1950

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DOES THE ELECTRICAL ENGINEER CONCENTRATE TOO MUCH ON "J", *by Philip Kemp, M.Sc., M.I.E.E.* 767

OUR READERS' VIEWS 772

MAINTENANCE METHODS—No. 4 773

BRITISH STANDARDS 774

NOTES ON WIRING, *by Megohm* 775

AIR-BLAST CIRCUIT BREAKERS 776

ANOTHER SET OF LETTERS 779

THE FUTURE OF COAL 780

THE NORTH OF SCOTLAND CONTROVERSY 780

PROBLEMS AND PRACTICE IN ENGINEERING 781

FRANCE EXPANDS HER POWER SUPPLY 783

OVERSEAS NEWS 784

PERSONALITIES IN THE INDUSTRY 786

I.E.E. MERSEYSIDE DINNER 788

INSTALL FOR RELIABILITY! 789

OIL REFINERY INSTALLATION 790

WIRES AND CABLES CENSUS 791

E.P.E.A. ANNUAL DINNER 791

POWER SPEEDS PUBLIC WORKS 792

THE BUYER'S COLUMN 793

POWER SUPPLY IN OCTOBER 795

THE WEEK IN NEWS 796

Questions in Parliament 801

Electric Supply News 802

Company Activities 803

COMMERCIAL INFORMATION 804

CLASSIFIED ADVERTISEMENTS *61*

INDEX TO ADVERTISERS *70*

SUBSCRIPTION RATES.—United Kingdom and Overseas £1 17s. 6d. per annum. Canada C$6 50c., U.S.A. $5 50c. per annum. Subscriptions are payable in advance and may commence with any issue throughout the year. Overseas subscriptions may be paid to The Electrical Times Limited by banker's draft, cheque or international money order. Single copies 6d. each.

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Editorial

PURCHASING POLICY

THE B.E.A. inherited from the electrical industry a system of stabilised prices, and their purchasing policy has accordingly been built up around these conditions. With the opening up in the last few weeks of a price war between manufacturers of an electrical product of which the supply industry is practically the sole purchaser, the B.E.A. will now have to give serious consideration to how to react to these new conditions. Should they take advantage of the substantial price cuts by buying from the cheapest manufacturer, thereby encouraging the elimination of the smaller firm? Or should they continue to purchase in the same proportion as before, ignoring the new price differentials? It will not be easy for area boards, particularly those heading for a deficit, to resist a saving of 10 to 20 per cent. on a major item of expenditure, yet too ready an acceptance of purchase at the lowest price may not be in their best long-term interests. It will therefore be instructive to watch how a nationalised body reacts to these conditions of price competition. Obviously the situation is one that calls for centralised consultation, but this cannot limit the free choice of the area boards. Whatever the decision it will be a lesson which may have an important bearing on the future.

ENOUGH EXAMS

IT IS commonly held that some improvement is needed in the arrangements for technological education existing in this country. On the other hand, the ways and means of bringing this about have been the subject of much controversy, to which fact the recent prolonged correspondence in the Press and the reports of various interested associations bear witness. Recommendations which bear an official imprint are disclosed in a report now issued by the Ministry of Education committee under the chairmanship of Sir Ronald Weeks. The most important of these asks that technical colleges should be relieved of their task of teaching the less advanced student, and thus be left free to conduct classes in higher education. As a corollary, there is a recommendation that better conditions should be provided in these colleges, both in the way of working facilities, salaries, and opportunities for research. If these proposals can be realised, then the required advance in the standard and output of technologists will be obtained. It seems to us that the remaining proposal of the committee that a Royal College of Technologists be set up, with the power to award associateships and fellowships and to approve courses of study becomes superfluous. The new foundation will have no duties that existing organisations, already supported by royal charters, and with an established reputation, are not equipped to carry out. Little good can come of the formation of yet another examining body awarding qualifications, having neither the utility of the national certificate series nor the kudos of the university.

FACTORY FLAMEPROOF GEAR

UNDERGROUND working conditions in collieries are such that it is impossible for equipment not to receive the roughest of treatments, and this is reflected in the heaviness of designs evolved for such applications. Flameproof electrical gear, developed principally for mining, naturally has this characteristic of great strength accentuated. When, however, it is used in factories, this traditional massiveness of design becomes a positive disadvantage; conditions in even the roughest foundry or chemical factory do not even approach those found underground. With this background, a tentative suggestion was made

at the I.E.E. last week, that a testing station for non-mining flameproof gear should be established. Judging by the enthusiastic support forthcoming, this idea must have been a vocalisation of a cri-de-coeur of installation engineers. Buxton test engineers, the argument goes, are steeped in a mining tradition which includes the characteristic tendency to weight. To avoid this fetish, it is proposed that users of factory flameproof gear should finance a suitable alternative establishment, and seek recognition of its certificates by the factory inspectorate. Considerable cooperation will be needed to launch such a project, and manufacturers may not like yet another range of standards to follow. The size of the prospective market will be the principal factor in determining the fate of this interesting idea.

WORST CONDITIONS

CONTINUOUS running is a nightmare to maintenance engineers, but fortunately in most installations it is unrealised. In the chemical industry, however, it very often exists—and with it working conditions so dirty, from the nature of the process, that the effect of no shutdown in production for incidental maintenance is accentuated. The utmost reliability is required of plant in such installations, and the engineer who operates it and keeps it running learns much that can benefit his colleagues in less exacting establishments. Our issue this week contains two articles recording the methods used by such engineers, the first written from the maintenance viewpoint of making the best of an existing installation, and the second dealing with the design and selection of new plant. One fact stands out in both. In the chemical industry, more than elsewhere, the electrical engineer has in his charge plant whose value is disproportionately small compared with the cost of damage its failure can cause. It is a tribute both to the skill of designers and electrical plant engineers that serious failure so seldom occurs, in spite of the onerous conditions.

STOCKPILE AND PRICES

THE panic prices in the tin market last week are something of a novelty in this era of price controls, but the record level of £1,282 a ton brought its own free market corrective, with a fall to well below the four figure mark in two days. It is by no means clear at what level tin will become stabilised under present market conditions, but with the U.S. stockpile programme committed to purchases up to £825 a ton it seems safe to say that a return to anything like the £600 level of a few months ago is far beyond the immediate perspective. Fortunately copper, after its substantial rise three months ago, has remained steady, but there is talk of a scarcity of aluminium arising next year, and rubber has proved equally as susceptible as tin to the indirect effects of U.S. stockpiling demand. The question may well be asked whether it is in America's own interest to continue to force these stockpile purchases against limited supplies at the price of disruption of the world's markets, since the principal countries affected by such demands are her partners in the Atlantic Pact.

OPERATION ALPHABET

J IS for jackdaw—but not in the primer of the electrical engineer. He meets the tenth letter of the alphabet as an aid in algebraic methods for the avoidance of inaccurate graphical vector calculations. For a few months he cherishes this new friend as sole representative of its species. Later in his experience he finds that there is nothing sacred in 90 degrees. The advent of symmetrical component theory introduces him to a (he may call it lambda), an operator with a 120° twist as its vocation. At this stage, if his mathematical inclinations resemble Meteor's, he retires from the game. But a was only the thin end of the wedge. As Mr. Kemp points out in this week's principal article, there is an operator (and a letter of some alphabet) for every angular difference—and those for multiples of 30° have a direct application to circuit analysis. However, even those who dislike mathematics in its purity appreciate it as a work saver, and to them we commend Mr. Kemp's novel attack on the problem of operators.

Meteor

Does the electrical engineer concentrate too much on "*j*"

PHILIP KEMP, M.Sc., M.I.E.E., discusses properties of other operators

MOST technically trained electrical engineers have a working knowledge of the *j* operator, whereby a vector quantity, voltage or current for example, is advanced in phase by 90°. A less number perhaps are familiar with the *a* operator, so useful in the solution of 3-phase problems, which results in a vector quantity being advanced in phase by 120°. It is not generally recognised, however, that there are an infinity of such vector operators, one for every angle of advance throughout the whole 360°. The properties and effects of any one of these vector operators can be worked out, if desired, but obviously this is an infinite task. There are, nevertheless, certain of these that are of sufficient interest to warrant some attention being paid those vector operators the phase angle of advance of which is 30° or a multiple of 30°.

It is obviously of importance, in 3-phase problems, to be able to advance or retard with facility the phase of a vector quantity by such angles as 30°, 60°, etc., in view of the frequency with which such operations are required. For example, there is the 30° phase difference between the line and the phase voltage, a fact that crops up in the measurement of 3-phase power by the two-wattmeter method. There is the 60° phase difference between the voltages in two different phases (one being reversed) of a 3-phase system, a condition found in zig-zag connected transformers. Many other examples may be conjured up involving angles that are multiples of these values.

The ordinary plus and minus signs can be regarded as vector operators of 0° and 180° respectively. In the former case, $\mathbf{P}+\mathbf{Q}$ implies that the two quantities "P" and "Q" are in phase, while the + sign indicates that plain arithmetic addition is to be carried out. In the latter case, $\mathbf{P}-\mathbf{Q}$ indicates that the two quantities "P" and "Q" are 180° out of phase, so that vector addition now becomes plain arithmetic subtraction. It is a fairly common practice, when dealing with vector operators, to denote vector quantities by Clarendon type, so that, using this convention, we have:—

$\mathbf{P}+\mathbf{Q}=P+Q$ (for a phase difference of 0°)

and $\mathbf{P}+\mathbf{Q}=P-Q$ (for a phase difference of 180°). For all other angles of phase difference, the arithmetic value of the vector addition represented by $\mathbf{P}+\mathbf{Q}$ lies somewhere between $P+Q$ and $P-Q$.

Employing the 90° or *j* operator we have, for the addition of two vectors with a phase difference of 90°:—

$$\mathbf{P}+\mathbf{Q}=P+jQ$$

In this latter form the evaluation of the resultant is impossible since substitution for the *j* operator can only be made by employment of the imaginary number $\sqrt{-1}$. Numerically, the resultant is equal to $\sqrt{P^2+Q^2}$.

When we come to the use of the 120° or *a* operator we have, for the addition of two vectors with a difference of 120°:—

$$\mathbf{P}+\mathbf{Q}=P+aQ$$

Again the direct evaluation of the resultant is impossible in this form, since the *a* operator is equivalent to a complex number having both real and imaginary components. It is, in fact, equivalent to $(-\frac{1}{2}+j\frac{\sqrt{3}}{2})$ as indicated in Fig. 1, since rotation through 120° may be replaced by multiplying by $-\frac{1}{2}$ along the real axis (since $\cos 120°=-\frac{1}{2}$) together with multiplying by $\frac{\sqrt{3}}{2}$ along the imaginary or *j* axis (since $\sin 120°=\frac{\sqrt{3}}{2}$).

The "a" Vector Operator

The *a* operator is somewhat similar to the *j* operator in its effect, but whereas the *j* operator results in a vector being rotated in an anti-clockwise direction through 90°, i.e. being advanced in phase by 90°, the *a* operator causes the vector to be rotated in an anti-clockwise direction through 120°, i.e. advanced in phase by 120°. Just as the symbol j^2 indicates that the vector has been twice rotated through 90° in an anti-clockwise direction, so does the symbol a^2 indicate that the vector has been twice rotated through 120°. Rotation through twice 90° is equivalent to a single rotation through 180°, and this in its turn is equivalent to a simple reversal, so that $j^2=-1$ and

$j = \sqrt{-1}$, this latter being an imaginary number. Similarly, a^3 represents a rotation in an anti-clockwise direction through an angle equal to three times 120°, or through 360°. This leaves the vector in its original position, so that a^3 may be written as $+1$, or $a^3=1$ and $a=\sqrt[3]{1}$. There are, however, three cube roots of $+1$, these being $(-\frac{1}{2}+j\frac{\sqrt{3}}{2})$, $(-\frac{1}{2}-j\frac{\sqrt{3}}{2})$ and unity. The cube of all these numbers is unity; the first represents a rotation of the vector in an anti-clockwise direction through 120°, the second through 240° and the third through 360°. (Rotation through $3\times120°$ or $3\times240°$ or $3\times360°$ leaves the vector in its original position in all three cases.)

Numerically, the sum of two vector quantities **P** and **Q** having a phase difference of 120° is equal to $\sqrt{P^2+Q^2-PQ}$, since

$$\begin{aligned}\mathbf{P}+\mathbf{Q}&=\mathbf{P}+a\mathbf{Q}\\&=\mathbf{P}+(-\tfrac{1}{2}+j\tfrac{\sqrt{3}}{2})\,\mathbf{Q}\\&=(\mathbf{P}-\tfrac{1}{2}\mathbf{Q})+j(\tfrac{\sqrt{3}}{2}\mathbf{Q})\end{aligned}$$

and this has a numerical value of

$$\sqrt{(P-\tfrac{1}{2}Q)^2+(\tfrac{\sqrt{3}}{2}Q)^2}$$
$$=\sqrt{P^2+Q^2-PQ}$$

If three equal vectors, mutually displaced by 120°, be considered, their sum is equal to zero, as is apparent from a consideration of a simple balanced 3-phase system. These three vectors may be represented by **P**, $a\mathbf{P}$ and $a^2\mathbf{P}$ (see Fig. 1). Then

$$\mathbf{P}+a\mathbf{P}+a^2\mathbf{P}=\mathbf{O}$$

so that $(1+a+a^2)=\mathbf{O}$

In the case of the j operator, the corresponding equation is

$$(1+j+j^2+j^3)=\mathbf{O}$$

The 60° vector operator results in a vector being rotated in an anti-clockwise direction through 60°, i.e. being advanced in phase by 60°. This is equivalent to rotating the vector through 240° in an anti-clockwise direction and then reversing it, so that this vector operator can be written $-a^2$, where the vector operator a represents a rotation through 120° in an anti-clockwise direction. Thus a^2 represents a rotation through twice 120°, i.e. 240°, while

Vector Operator	*Equivalent in terms of*			
	j Operator	*a Operator*	*b Operator*	*c Operator*
30°	$\frac{\sqrt{3}}{2}+j\frac{1}{2}$	$\frac{2}{\sqrt{3}}+a\frac{1}{\sqrt{3}}$	$\frac{1}{\sqrt{3}}+b\frac{1}{\sqrt{3}}$	c
60°	$\frac{1}{2}+j\frac{\sqrt{3}}{2}$	$1+a$	b	$-1+c\sqrt{3}$
90°	j	$\frac{1}{\sqrt{3}}+a\frac{2}{\sqrt{3}}$	$-\frac{1}{\sqrt{3}}+b\frac{2}{\sqrt{3}}$	$-\sqrt{3}+c2$
120°	$-\frac{1}{2}+j\frac{\sqrt{3}}{2}$	a	$-1+b$	$-2+c\sqrt{3}$
150°	$-\frac{\sqrt{3}}{2}+j\frac{1}{2}$	$-\frac{1}{\sqrt{3}}+a\frac{1}{\sqrt{3}}$	$-\frac{2}{\sqrt{3}}+b\frac{1}{\sqrt{3}}$	$-\sqrt{3}+c$
180°	$j^2=-1$	$-a^3=-1$	$b^3=-1$	$c^6=-1$
210°	$-\frac{\sqrt{3}}{2}-j\frac{1}{2}$	$-\frac{2}{\sqrt{3}}-a\frac{1}{\sqrt{3}}$	$-\frac{1}{\sqrt{3}}-b\frac{1}{\sqrt{3}}$	$-c$
240°	$-\frac{1}{2}-j\frac{\sqrt{3}}{2}$	$-1-a$	$-b$	$1-c\sqrt{3}$
270°	$-j$	$-\frac{1}{\sqrt{3}}-a\frac{2}{\sqrt{3}}$	$\frac{1}{\sqrt{3}}-b\frac{2}{\sqrt{3}}$	$\sqrt{3}-c2$
300°	$\frac{1}{2}-j\frac{\sqrt{3}}{2}$	$-a$	$1-b$	$2-c\sqrt{3}$
330°	$\frac{\sqrt{3}}{2}-j\frac{1}{2}$	$\frac{1}{\sqrt{3}}-a\frac{1}{\sqrt{3}}$	$\frac{2}{\sqrt{3}}-b\frac{1}{\sqrt{3}}$	$\sqrt{3}-c$
360°	$j^4=1$	$a^3=1$	$b^6=1$	$c^{12}=1$

the minus sign indicates reversal, or 60° $=(2\times120°\pm180°)$. But $-a^2=(1+a)$ since $(1+a+a^2)=0$, so that the 60° vector operator can be expressed alternately as $-a^2$ or $(1+a)$. These two ways of expressing the same thing are illustrated graphically in Fig. 2 (a) and (b) where OA is the original vector of unit length and OR is a similar vector of unit length after rotation through 60° in an anti-clockwise direction. Fig. 2(b) also shows quite simply that OR is the vector sum of OA and OB, i.e. OR is a vector of unit length obtained by moving the point O one unit in the real direction along OA and one unit in the a direction along OB. Expressed in terms of the j operator, the 60° vector operator can be written $(\frac{1}{2}+j\frac{\sqrt{3}}{2})$.

Derivation of 60° Vector Operator

The addition of two vector quantities **P** and **Q** having a phase difference of 60° can now be expressed as:—

$$\mathbf{P}+\mathbf{Q}=\mathbf{P}+b\mathbf{Q}$$

where b represents the 60° vector operator.

To obtain the numerical value of $\mathbf{P}+\mathbf{Q}$, it can be written in the form

$$\mathbf{P}+\mathbf{Q}=\mathbf{P}+(\tfrac{1}{2}+j\tfrac{\sqrt{3}}{2})\mathbf{Q}$$
$$=(\mathbf{P}+\tfrac{1}{2}\mathbf{Q})+j(\tfrac{\sqrt{3}}{2}\mathbf{Q})$$

the numerical value of which is:—

$$\sqrt{(\mathbf{P}+\tfrac{1}{2}\mathbf{Q})^2+(\tfrac{\sqrt{3}}{2}\mathbf{Q})^2}$$
$$=\sqrt{\mathbf{P}^2+\tfrac{1}{4}\mathbf{Q}^2+\mathbf{PQ}+\tfrac{3}{4}\mathbf{Q}^2}$$
$$=\sqrt{\mathbf{P}^2+\mathbf{Q}^2+\mathbf{PQ}}$$

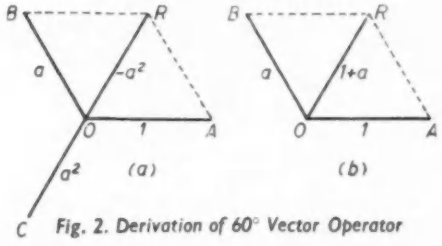


Fig. 2. Derivation of 60° Vector Operator

If six equal vectors, mutually displaced by 60°, be considered, their sum is again equal to zero (see also the 120° case). These six vectors may be represented by **P**, $b\mathbf{P}$, $b^2\mathbf{P}$, $b^3\mathbf{P}$, $b^4\mathbf{P}$ and $b^5\mathbf{P}$, from which it follows that

$$(1+b+b^2+b^3+b^4+b^5)=0.$$

But $b^3=a$ and $b^4=a^2$, so that $(1+b^3+b^4)=0$ since $(1+a+a^2)=0$, and substituting -1 for b^3, we have

$$(1-b+b^2)=0$$

Again, since $b^2=a$, therefore

$$b^2=a+(1+a+a^2)$$
$$=(1+a)^3$$

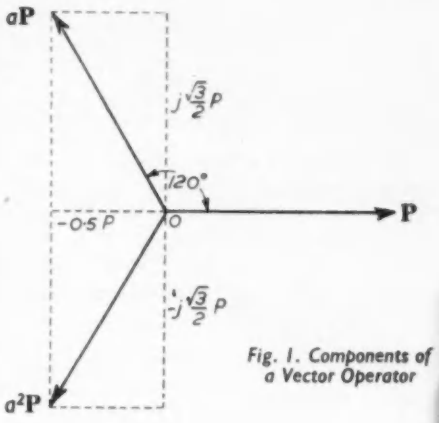


Fig. 1. Components of a Vector Operator

and $b=(1+a)$.

Also $b^6=1$, so that $b=\sqrt[6]{1}$.

The 30° vector operator can also be expressed in terms of the a and the j operators, and Fig. 3 (a) and (b) shows how this vector operator is derived from the a operator. Again OA represents the original vector of unit length, while $\mathrm{OB}=-a^2$ represents this vector after rotation through 60°. The resultant of OA and OB is OR and is clearly equal to $(1-a^2)$, but since this vector is $\sqrt{3}$ times as long as the original one, a reduction factor of $\frac{1}{\sqrt{3}}$ must be introduced to restore the vector to its original length. Alternatively, OB might be written $(1+a)$ as shown in Fig. 3(b), when OR becomes $(2+a)$. The reduction factor of $\frac{1}{\sqrt{3}}$ is again introduced giving $\frac{2+a}{\sqrt{3}}=\frac{1-a^2}{\sqrt{3}}$ as the equivalent of the 30° vector operator in terms of the a operator. In terms of the j operator, the 30° vector operator can be written $(\frac{\sqrt{3}}{2}+j\frac{1}{2})$.

Derivation of 30° Vector Operator

The addition of two vector quantities **P** and **Q** having a phase difference of 30° can now be expressed as

$$\mathbf{P}+\mathbf{Q}=\mathbf{P}+c\mathbf{Q}$$

where $c=\frac{2+a}{\sqrt{3}}=\frac{1-a^2}{\sqrt{3}}$ represents the 30° vector operator.

To obtain the numerical value of $\mathbf{P}+\mathbf{Q}$ for this case, it is written in the form

$$\mathbf{P}+\mathbf{Q}=\mathbf{P}+(\tfrac{\sqrt{3}}{2}+j\tfrac{1}{2})\mathbf{Q}$$
$$=(\mathbf{P}+\tfrac{\sqrt{3}}{2}\mathbf{Q})+j(\tfrac{1}{2}\mathbf{Q}).$$

The numerical value of this is

$$\sqrt{(P+\tfrac{\sqrt{3}}{2}Q)^2+(\tfrac{1}{2}Q)^2}$$
$$=\sqrt{P^2+\tfrac{1}{4}Q^2+\sqrt{3}PQ+\tfrac{1}{4}Q^2}$$
$$=\sqrt{P^2+Q^2+\sqrt{3}PQ}.$$

Proceeding in the same way as before we now have

$$(1+c+c^2+\cdots\cdots\cdots+c^{11})=O$$

and choosing three vectors that are mutually 120° out of phase we have, for example,

$$(1+c^4+c^8)=O=(1-c^2+c^4)$$

since $c^6=-1$, from which we have $c^4=c^2-1$.

Again, adding two vectors having a phase difference of 60° we have

$$1+c^3=c\sqrt{3}$$

from which

$$c^3=-1+c\sqrt{3}$$

and

$$c^4=1-c2\sqrt{3}+c^23$$

so that

$$(1-c^3+c^4)=1-(-1+c\sqrt{3})+(1-c2\sqrt{3}+c^23)$$

and $$1-c\sqrt{3}+c^3=O.$$

The various powers of c can now be evaluated; for example:—

$$c^5=c\times c^3=c(-1+c\sqrt{3})$$
$$=-\sqrt{3}+c2.$$

Again $c^5=-a^2$, since both represent an advance in phase of 60°. Therefore:—

$$c=\sqrt{-a^2}=\sqrt{-1}(-a)=-ja.$$

This is the equivalent of advancing the phase by 90° (represented by j), then advancing the phase by a further 120° (represented by a), and finally reversing the resultant (represented by the minus sign).

Proceeding in the same way, the 150° vector operator is seen to be equivalent to jb, since j results in a phase advance of 90° and b in a further phase advance of 60°. Substituting for b, we now have

$$jb=j(\tfrac{1}{2}+j\tfrac{\sqrt{3}}{2})=-\tfrac{\sqrt{3}}{2}+j\tfrac{1}{2}.$$

Considering the general case of the addition of two vectors having a phase difference of θ we have

$$P+Q=P+\angle\theta Q$$
$$=P+(\cos\theta+j\sin\theta)Q$$
$$=P+Q\cos\theta+jQ\sin\theta,$$

the numerical value of which is:—

$$\sqrt{(P+Q\cos\theta)^2+(Q\sin\theta)^2}$$
$$=\sqrt{P^2+Q^2\cos^2\theta+2PQ\cos\theta+Q^2\sin^2\theta}$$
$$=\sqrt{P^2+Q^2+2PQ\cos\theta}.$$

If $\frac{2\pi}{\theta}$ equal vectors, mutually displaced by θ (radian measure) be added together their sum will always equal zero.

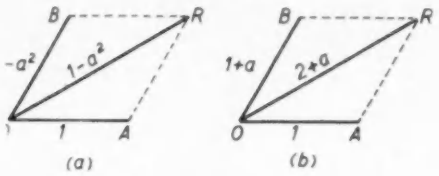


Fig. 3. Derivation of 30° Vector Operator

The equivalents of various vector operators have been determined above and these, together with others at intervals of 30° throughout the full 360°, are tabulated for convenience in the table on page 768.

The addition of two vectors at an angle can be carried out by means of the appropriate vector operator, and these additions are shown for all the cases discussed above in the following table, together with the numerical resultant in each case.

Vector Operator	*Angle of Phase Difference*	*Vector Addition of* **P** and **Q**	*Numerical value*
j	90°	$\mathbf{P}+j\mathbf{Q}$	$\sqrt{P^2+Q^2}$
a	120°	$\mathbf{P}+a\mathbf{Q}$	$\sqrt{P^2+Q^2-PQ}$
b	60°	$\mathbf{P}+b\mathbf{Q}$	$\sqrt{P^2+Q^2+PQ}$
c	30°	$\mathbf{P}+c\mathbf{Q}$	$\sqrt{P^2+Q^2+\sqrt{3}PQ}$
General case	θ	$\mathbf{P}+\angle\theta\mathbf{Q}$	$\sqrt{P^2+Q^2+2PQ\cos\theta}$

Examples of Use

The following examples illustrate the use of these vector operators.

The currents in a balanced 3-phase 3-conductor system are represented by the vectors **A**, **B** and **C**. The vector sum of these is given by (**A**+**B**+**C**), and this expression may be rewritten $(\mathbf{A}+a^2\mathbf{A}+a\mathbf{A})=(1+a+a^2)\mathbf{A}=O$ since $(1+a+a^2)=O$. The same argument might be applied to the positive and negative phase-sequence components separately, so that the sum of each set of components must also be zero. It follows that the sum of the zero phase-sequence components must similarly be zero, since the vector sum of all three line currents must be zero in a 3-conductor system. But by hypothesis the zero phase-sequence components are all equal and in phase, so that since their sum is zero, each individual zero phase-sequence component must be zero; in

other words, no zero phase-sequence components can exist in a 3-conductor system.

An example of the use of the b operator is found in the analysis of the currents in a 3-phase system into symmetrical components, by the method whereby the currents in the B and C phases are each rotated through 120° towards the phase of the current in the A phase. It is assumed that all zero phase-sequence components have been eliminated should they exist; i.e. one-third of the current returning to the star point must be subtracted from the current flowing out in each of the three line conductors. The three line currents, **A**, **B** and **C**, now consist solely of positive and negative phase-sequence components and they may be represented by Fig. 4. The vector representing the current in phase B is now rotated in an anti-clockwise direction through 120° towards A, the **B** vector taking up the position **B′**. Similarly, the vector representing the current in phase C is rotated in a clockwise direction through 120° towards A, the **C** vector taking up the position **C′**. The positive phase-sequence component in phase A is now equal to $\frac{1}{3}(\mathbf{A}+\mathbf{B}'+\mathbf{C}')$.

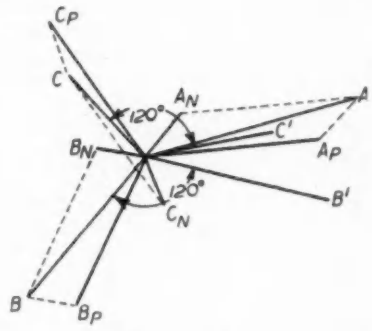


Fig. 4. Analysis into Positive and Negative Phase-Sequence Components

Employing the b or 60° vector operator, the proof of this is as follows:—

$$\mathbf{A}=\mathbf{A_P}+\mathbf{A_N}$$
$$\mathbf{B}=\mathbf{B_P}+\mathbf{B_N}=b^4\mathbf{A_P}+b^2\mathbf{A_N}$$
$$=-b\mathbf{A_P}+b^2\mathbf{A_N}$$
$$\mathbf{C}=\mathbf{C_P}+\mathbf{C_N}=b^2\mathbf{A_P}+b^4\mathbf{A_N}$$
$$=b^2\mathbf{A_P}-b\mathbf{A_N}$$

Now $\mathbf{B}'=b^2\mathbf{B}$
$$=b^2(-b\mathbf{A_P}+b^2\mathbf{A_N})$$
$$=\mathbf{A_P}-b\mathbf{A_N}$$

and $\mathbf{C}'=b^4\mathbf{C}=-b\mathbf{C}$
$$=-b(b^2\mathbf{A_P}-b\mathbf{A_N})$$
$$=\mathbf{A_P}+b^2\mathbf{A_N}$$

so that $\mathbf{A}+\mathbf{B}'+\mathbf{C}'=(\mathbf{A_P}+\mathbf{A_N})+(\mathbf{A_P}-b\mathbf{A_N})+(\mathbf{A_P}+b^2\mathbf{A_N})$
$$=3\mathbf{A_P}+(1-b+b^2)\mathbf{A_N}$$
$$=3\mathbf{A_P}$$

since $(1-b+b^2)=\mathbf{O}$

and $\mathbf{A_P}=\frac{1}{3}(\mathbf{A}+\mathbf{B}'+\mathbf{C}')$.

Analysis into Positive and Negative Phase-Sequence Components

As an example in the use of the c or 30° vector operator, consider the case of the stator winding of a single-phase generator having six slots per pole of which only four are wound. The vector sum of the conductor e.m.f.'s is given by $(1+c+c^3+c^5)\mathbf{E}$ where **E** is the induced e.m.f. per slot.

Now $(1+c+c^3+c^5)=1+c+(-1+c\sqrt{3})+(-\sqrt{3}+c2)$
$$=-\sqrt{3}+c(3+\sqrt{3}),$$

the arithmetic value of which is (see table):—

$$\sqrt{(-\sqrt{3})^2+(3+\sqrt{3})^2+\sqrt{3}(-\sqrt{3})(3+\sqrt{3})}$$
$$=3{\cdot}34$$

giving a distribution factor for the winding of $\frac{3{\cdot}34}{4}=0{\cdot}835$.

The symbol j for the 90° vector operator is now universally adopted in electrical engineering circles, but the symbol a for the 120° vector operator is not so well established. In fact, quite a number of engineers use the symbol λ in this connection. The 60° and 30° vector operators have, up to the present, no generally accepted symbol, and it is here suggested that these three vector operators, i.e. those for 120°, 60° and 30°, be named the a, b and c vector operators respectively, this nomenclature having the merit of order and simplicity.

Most engineers are trained to think in terms of rectangular co-ordinates, so that the use of the j operator comes naturally to them. When occasion demands the use of another operator, such as the a operator now frequently used in the solution of 3-phase problems, it is the mental habit of the great majority to translate all a quantities into real and j components. With continued use, however, one can get into the habit of thinking in terms of a, b and c units, and when this faculty is acquired, facility in the use of these operators is greatly enhanced.

Our readers' views . . .

Tax on Safety

AT the last meeting of my Council held on November 3, I brought to the notice of the members your editorial comments headed "Tax on Safety," published in your issue of October 12, 1950. You will perhaps be interested to learn that after considering your comments, together with other information, the Council passed the following resolution:

"That in the interests of safety, this Council recommend the Chancellor of the Exchequer to abolish or lower the Purchase Tax on all electric radiators fitted with approved safety devices."

I propose, when forwarding this resolution to the Chancellor, to quote your remarks on the subject and I trust you will have no objection to my doing so. It is also intended to forward copies of the resolution to Members of Parliament for North-Western constituencies and to try to enlist the support of other organisations.

F. J. Marron

SECRETARY, THE NORTH WESTERN ELECTRICITY CONSULTATIVE COUNCIL

• • •

DC Motors

IN connection with the very useful notes concerning maintenance of DC motors published in your last issue, the brush potential curves shown in Fig. 4 on page 735 would prove more useful if the right-hand side of the pole piece shown had been marked "leading edge," for these curves are dependent on direction of rotation.

LONDON. *A. N. D. Kerr*

• • •

T. P. Wilmshurst—An Appreciation

WITH the passing of T. P. Wilmshurst, M.B.E., M.INST.C.E., M.I.E.E., the electrical industry loses one of the most genial and progressive of the early generation of municipal electrical engineers. After experience at Taunton, Exeter and Halifax he became "chief" at Derby, the only single-phase station in the country with a frequency of 40! I particularly recall a visit I made there about 1912 to write an article for my old paper "The Electrician," on the extension of the Borough supply into several rural adjoining areas. "T.P's" almost boyish delight at having overcome strong local opposition in the matter of *overhead* lines and wayleaves was a sheer joy to witness. He was not content to hand me over to one of his assistants but personally gave me the data I required and himself conducted me over several installations, then mostly for lighting. His pioneer work in this direction probably laid the foundations of the Overhead Lines Association.

"T.P." was always approachable and his natural kindliness and personal charm endeared him to all with whom he made contact. A really lovable good man who will be greatly missed. *Salve at Vale.*

W. E. Warrilow
M.I.E.E.

BOURNEMOUTH

• • •

Electric Fire Safety

I SEE by one of your recent issues that the makers of one of their electric fires has fitted a guard to it. This to my mind has been long overdue. As it is compulsory for parents to put a fire guard to protect their children from gas fires, why has this not been compulsory to protect them from electric fires, which is to my mind far more dangerous than a coal fire, due to the risk of electric shock as well as fire?

To turn the subject, why are not steam turbine casings prefabricated ?

Another idea of mine is to heat steam boilers by coal gas. This to my mind would save banking up of boilers and save capital expenditure in chain grate stokers and pulverised fuel apparatus.

SHROPSHIRE. *Hugh L. Taylor*
A.M.I.E.E.

[*An account of fabricated l.p. turbine casings appeared in the proceedings of the B.T.H. Summer School in 1948. Fabrication of the thicker and more complicated h.p. end would, we feel, present little advantage. As regards gas firing, there is something to be said for it if coke were the main product and gas the by-product, but for normal use it appears impracticable.*—ED.]

MAINTENANCE METHODS — No. 4

Dust and Acid

Corrosion and abrasion complicate operation of electrical plant in Chemical Works

DUST and acids are no friends of the maintenance engineer, and when the main duty of the plant he keeps running is the production of an acid salt from a highly abrasive ore, he has a bigger job than usual on his hands. Such is the situation that faces Mr. A. C. Clacher, the electrical engineer at the old-established chemical works of John and James White Ltd., of Rutherglen, near Glasgow. For 130 years this firm has carried out the production of chrome salts from chromite ore, and the application of electricity to the process has gradually increased in the past 20 or so years until there are now some 500 motors used, in sizes up to 125 h.p. Most of this equipment has been installed since 1936, so at least the electrical plant is up to date, but it has few other advantages that ease the work of maintenance.

Chromite, a hard black ore, is the starting point in the production of the chrome salts, and it is ground to a 200 mesh powder, mixed with soda and dolomite, and fired in rotary kilns with plenty of air. Treatment of the resultant chromium compound with concentrated sulphuric acid yields red crystals of sodium dichromate, the starting point for the preparation of many other derivatives of chromium. The powder in the early stages of the process is extremely abrasive, and is itself a prime cause of trouble in the plant, while the existence of various liquors which when spilt or splashed soon evaporate to leave a strong crystalline deposit, improves neither the working of machinery nor the appearance of the factory.

Generation and Distribution

Private generation supplies most of the electric power required in the works. For this purpose, steam is generated at 250 lb/sq in. and exhausted at 70 lb/sq in. for process applications. Two reciprocating engines drive 170 kW generators, and turbines power 600 kW and 750 kW alternators, all supplying a 3-phase 440 V network. From the busbars p.i.l.c. cables controlled by 800 amp switches comprise a radial system feeding seven substations at various points around the 40-acre works. Part of the works has an additional supply of about 250 kW capacity, taken from the public mains, normally used for standby purposes only.

At each substation a distribution board is fed via a main switch, and from this cables are taken to further distribution and switch panels which are placed near important machines. In addition, each substation houses a step-down transformer that provides a 110 V centre point earthed single-phase supply for the lighting circuits. To facilitate the work of the electricians a comprehensive drawing of the circuits supplied is kept in each sub-station.

Up to the substations, at least, electrical equipment can be fairly effectively protected. Beyond this point the conditions discussed above apply, and plant has to be arranged on the principle that everything will be freely hosed down. Heavy gauge steel conduit, painted with a sulphuric acid resisting enamel, is used for all cabling, and where lead-covered cables are applied they require careful treatment. At distribution boards, the cables are brought into sorting boxes run vertically at one end of the steel framework of the boards. They are then taken neatly in conduit to lines of fuseboards and starters, etc. A feature is made of keeping isolators directly beneath starters, where this is at all possible.

Motors at Work

Most of the motors are 10 h.p. four-pole squirrel-cage machines, used to drive pumps, but some slip-ring units are in use. For instance, they are applied wherever it is necessary to have a variable speed, and in order to maintain the use of alternating current everywhere, they are then equipped with continuously rated George Ellison starters for speed regulation. To keep out the abrasive powder the slip-ring ends are kept enclosed in a tightly lashed canvas cover when the machines are running.

Many of the troubles are mechanical, and there is the usual tendency of operatives to attempt to cheat overload trips so that partially

stuck machines can continue to run. Another cause of motors burning out is the gradual accumulation of a sludge formed from the acid, liquors and dust, which collects and solidifies on the motors, blocking the ventilating fins and effectively heat insulating the machines.

Terminal covers of machines near the liquor tanks have to be sealed with grease, since the acid attacks the copper. Another effect of the conditions is that painted numbers, etc., soon become obliterated, and so engraved ivorine labels have to be used for the identification of starters, switchboxes and other control gear.

Maintenance

At present the maintenance staff employed to look after this installation comprises, in addition to the electrical engineer, five maintenance engineers, two armature winders, an apprentice and a labourer whose main task is lamp cleaning. Systematic maintenance has reduced the staff to this number working regularly from a former total of 13 electricians, most of whom were working a considerable amount of overtime.

The improvement has been effected largely by the institution of a night shift, worked by one man at a time. This duty electrician confines himself entirely to maintenance work except for any emergency action necessary. Every night there is a certain section of the plant scheduled to be inspected, with all electrical gear cleaned and overload trips checked for freedom. Large repair work and all installation is left for the day shift. In addition to the areas which are inspected in turn, there is the acid section of the plant which is overhauled every night because of its exceptionally severe working conditions.

As a result of this practice of inspection, the number of breakdowns experienced has been very greatly reduced, and the feeling that the maintenance staff are only to be called in after something has actually gone wrong has been successfully dispelled.

The use of 55 V lighting underlines the attention to safety measures which is kept up in the firm, and as a further step in this direction the earth continuity system is checked as part of the night's work. In general the conduit is relied on for this purpose, with bonding wires to motors when these are fed through flexible metal tubes. Other safety measures are the restriction of all portable appliances to 25 V working, and the use of 660 V grade installation for all trailing cables.

Some routine work is eased by the use of special clips at the end of porcelain fuse holders, to facilitate rewiring.

Lamp maintenance is increased by the low roofs prevailing in the factory, which both make it impossible to use large units for lighting and at the same time increase the exposure to the corroding vapours.

Since the Clyde flows alongside the works, a good power station earth is obtainable. In general, earth leakage conditions within the plant are good, considering the conditions, but a meter is installed at the main switchboard to keep a check on this.

A loose-leaf ledger system is in use to keep a record of electrical equipment and the attention that it receives. One sheet is provided for each motor, and on it is entered, in addition to the works number and the usual name-plate details, bearing particulars, notes on location and the machine driven, details of installation and subsequent rewinds, and the date installed. The other side of the sheet is marked out for recording all inspections and greasings, together with the name of the electrician carrying them out, so that responsibility can be assigned. Notes on any repairs necessary are also made on this sheet.

BRITISH STANDARDS

Letter Symbols for Electronic Valves. *B.S. 1409, 1950. Price 2s.* This specification is a revision of the 1947 edition, which was based on recommendations of the British Radio Valve Manufacturers' Association. The object is the standardisation of letter symbols used in catalogues and in other technical literature, relating to different types of valves and their electrodes and other components, and to the quantities used in valve technique. As well as a list of existing symbols, the Standard sets out the principles on which the evolution of new symbols should be based.

Steel Balls for Brinell hardness testing. *B.S. 240. Part 2, 1950. Price 2s.* This British Standard is a revision of B.S. 240, Pt. 2, published in November 1929. Its scope is unchanged in that it specified the hardness of balls used in carrying out Brinell tests, and having diameters of 10, 5, 2 and 1 mm. It requires that the standard method of determining this hardness shall be by a diamond pyramid hardness test, but specifies a reciprocal pressure test for use where a diamond hardness testing machine is not available.

The revision largely affects the hardness numbers set out in the tables dealing with the two different methods specified.

British Standards noted above can be obtained post free at the price mentioned, from the B.S.I., Sales Department, 24 Victoria Street, London S.W.1.

Notes on Wiring
by MEGOHM

13-amp Socket-outlets

Should not to be used with direct current

AS any regular reader of these random "notes" will be aware, I have always been an advocate of standardisation in the sense of simplification, and deprecated the present tendency of the powers-that-be to guide our activities by a mass of semi-related and overlapping rules, codes and regulations. This spate of published matter makes it a physical impossibility for the average busy man to read, let alone digest, the many items with which he should be conversant, and also introduces the danger of discrepancies or omissions being overlooked.

I am reminded of this danger by an item appearing in the official E.C.A. letter sent to all members on the first of this month, a copy of which was kindly forwarded to me, drawing attention to I.E.E. regulation 201 (c) dealing with 13-amp socket-outlets to B.S. 1363.

For the benefit of the uninitiated I would add that the E.C.A. have representation on both committees, and have a very live Technical Committee which disseminates advice and information to all members at regular intervals.

Amendment to B.S. 1363

To my mind, an all-purpose socket-outlet is a logical requirement for ordinary domestic establishments, and, perhaps to a lesser degree, for office and other business premises. When therefore a standard was officially arrived at in 1947, I for one thought that the matter had been settled, and that at last we had a truly universal all-purpose socket-outlet.

Unfortunately, as the E.C.A. letter reminds us, it was not considered at the time that these sockets would be used on other than a.c. circuits, and consequently neither the regulations nor the specification prohibited their use on d.c. supplies. For reasons unknown to me, it was subsequently decided by the Standardising Committee of the B.S.I. to restrict the application of the socket-outlets to a.c. only, and in consequence an amendment slip to B.S. 1363 was published in May this year, altering the title to read: "Two-pole and earthing-pin fused-plugs and shuttered socket-outlets for a.c. circuits up to 250 V (not intended for use on d.c. circuits)."

This alteration creates the anomalous position that according to the I.E.E. we can wire the circuits whether a.c. or d.c., but we cannot obtain any approved sockets if the supply is d.c. Perhaps, therefore, we may look forward to an amendment to the I.E.E. regulations, which by a coincidence were published on the same date as the B.S.S. revision slip referred to.

Comparative Values

The E.C.A. circular letter opines that the trouble now foreseen may be due to insufficient clearances, but I am not convinced that this is the true explanation. If one compares the values given in B.S. 1363 for the 13-amp sockets with those in B.S. 576 for the 2-, 5- and 15-amp sockets, the differences are not so very great.

Many of the clauses in the two specifications are very similar, for example, the minimum clearance-distance in air and the minimum creepage-distance is 0.1 in. in both cases; the insulation resistance rest is the same, i.e. a minimum of 100 megohms at 500 V d.c., and the high voltage test is in fact rather more severe for the 13-amp socket, the test voltage for this being 2000 a.c. as compared to 1500 V for the 15-amp size.

Finally, for most practical purposes a d.c. socket may be regarded as a convenient connecting link, rather than a means of controlling the supply, as every socket on a d.c. circuit must be controlled by a switch immediately adjacent or combined therewith, *vide* reg. 608 (E).

Fuses the Trouble?

Pending official classification, we must therefore assume that the trouble is expected from the fuses, and if we consult the relevant specification B.S. 1362 we discover that Part 1 deals exclusively with fuses for a.c. circuits, and Part 2—which is earmarked for d.c. circuits—is simply marked "under consideration."

So perhaps after all that is the answer to the mystery, but it has taken a close study of two B.S. specifications to discover that the I.E.E. regulations do not permit 13-amp socket-outlets on d.c. circuits, though presumably we may still use fused plugs to B.S. 5216 with fuses to B.S.646.

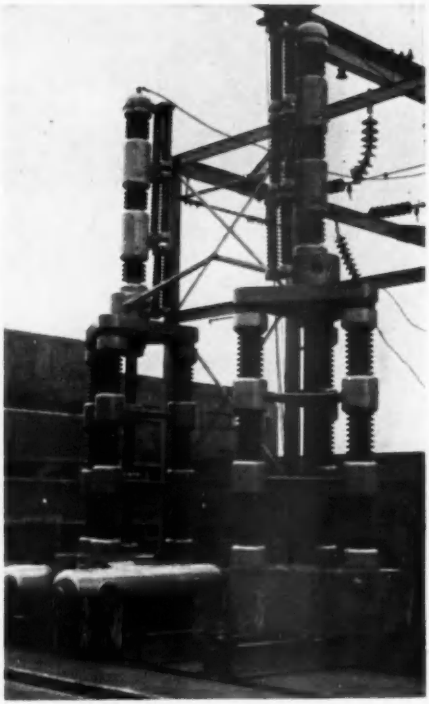
Air-Blast Circuit-Breakers

English Electric's Design Range Covers 66-400 kV with Standard Interrupter

IN last week's issue of the ELECTRICAL TIMES, we gave a short account of test demonstrations on air-blast circuit-breakers at the Nelson Research Laboratories of the English Electric Co., Ltd. ("Television in the Test Bay," p. 741). Further details being now available, it is possible to give some description of the range of air-blast circuit-breakers designed by this company.

General Design

The interrupter unit is of the single-flow axial blast type, in which a moving contact is operated by the air pressure, the arc and its products being swept by the blast through the throat of the fixed contacts into restricted coolers whence they are exhausted to atmosphere. The moving contacts of the interrupter have "probes" or extended centres, to take the arc during the opening period and thus protect the main contact surfaces. Immediately following this, a pneumatic mechanism opens an external isolating switch, commonly known as the "make switch" since when it is required to close the breaker the operation consists in merely closing this isolator which is designed to make heavy currents.



One pole of the 275 kV breaker

The interrupter heads are of unit construction, each consisting of a pair of contacts, a base casting and an insulator, and the same design of interrupter is used throughout the range, the number used in each breaker

Fig. 1 132 kV

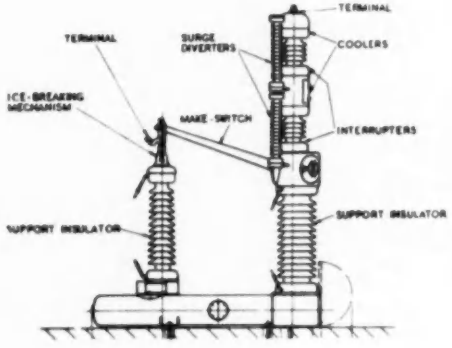
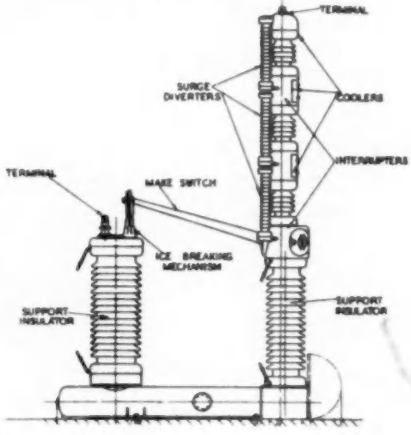


Fig. 2 165 kV



depending on the voltage and rupturing capacity required, which varies as follows:

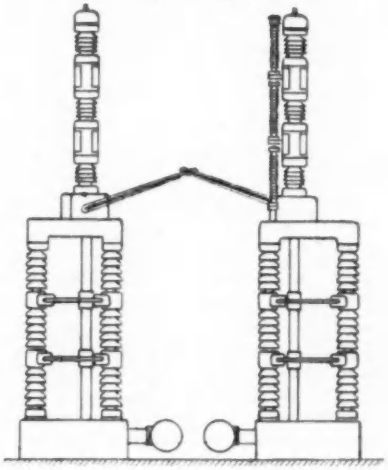
66 kV	1,500 MVA	1 head	
132	„ 2,500 „	2	„
132	„ 3,500 „	3	„
165	„ „	3	„
220	„ 5,000 „	4	„
275	„ 7,500 „	6	„
400	„ 10,000 „	8	„

General arrangements and relative sizes of 132, 165, 275 and 400 kV ratings are shown in Figs. 1-4. For 132 and 165 kV ratings, the interrupter heads are mounted on top of a single insulator stack which also provides a passage for the air from the receiver. The isolator contact is mounted upon another insulator or upon the current transformer housing, according to the circuit arrangements. For both these ratings each single-pole unit is mounted directly on top of its air receiver.

Above these ratings, i.e. 275 and 400 kV, to give better air distribution to the contacts, the interrupter heads are mounted in two stacks, each being supported not by a single insulator but by stacks of three in tripod formation. To give greater stiffness, the stacks are stayed together at intermediate points. There is a central insulator to conduct the main air to the interrupter heads, the tripod supports being used for air passages to the isolator mechanism, and for mechanical auxiliary switch drives.

The isolators used on these ratings dispense with the stationary clip contact, and have double blades meeting in the centre. For these larger ratings, the units are not mounted directly upon the air receivers, but each stack has its own receiver mounted at the side of the main base, so that it is more readily accessible for inspection. There are, therefore, six air receivers per triple-pole breaker.

Fig. 3 275 kV



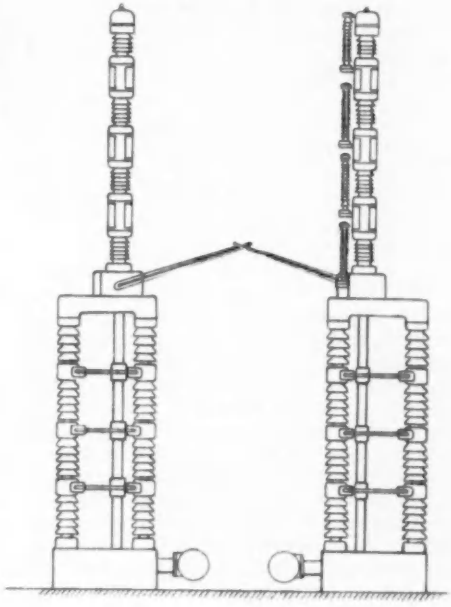
Make-Switch

The make-switch, or isolator, is designed for making peak fault currents, and making tests were actually witnessed on the 132 kV unit, the maximum current made being 33.5 kA (peak) at a voltage of 38 kV, operation being successful, in spite of the pre-arcing which is inseparable from any high-voltage contacts operating in air.

In order to guard against any possibility of isolators remaining closed due to ice formation or other causes, ice-breakers are provided upon each contact. These consist of a small pneumatic hammer which, immediately prior to the operation of the isolator mechanism, deals the blade a smart blow, thus actually knocking it out of its contact. Tests upon this device were also witnessed, a heavy ice accumulation being quite easily broken up.

As is well known, transient faults on transmission lines can be cleared with a minimum of system disturbance if auto-reclosing can be utilised within the time limits necessary for stability, i.e., before synchronous machinery can drop out of step. This time is, of course, exceedingly small (10-12 cycles average) and the high inertia of a large switch blade is un-

Fig. 4 400 kV



Removing breaker contacts showing special ladder

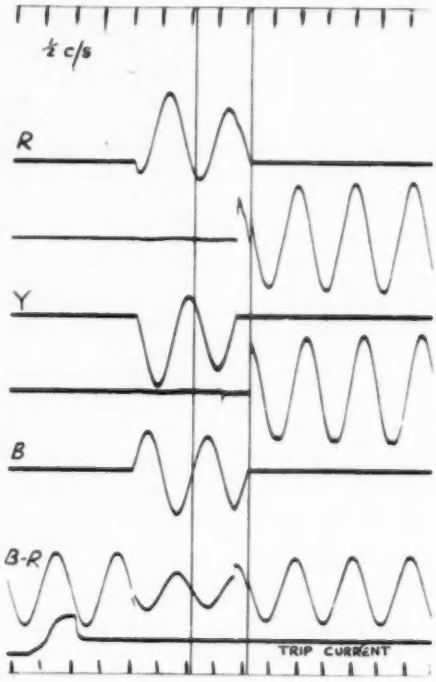
suitable for the purpose. Where auto reclosing is required, therefore, the make-switch is held closed and the interrupter contacts are held open by the blast for the pre-determined dead time, then allowed to reclose. Further operation, in case of a persistent fault, then takes place in the usual manner, with the isolator opening and the breaker locking-out.

Resistance Switching

One of the main problems of multi-contact interruption on any type of high voltage circuit-breaker, either air or oil, is ensuring that there is equal voltage distribution between the various heads. This applies not only to the circuit recovery voltage but, even more importantly to the r.r.r.v. (rate of rise of restriking voltage or, more compactly, the "restriking transient") which is a function of the natural frequency of the system. In order to obtain the requisite evenness of distribution, each contact head is shunted by a non-linear resistor of the surge diverter type.

Maintenance

The interrupter heads are so designed that both fixed and moving contacts can be withdrawn through doors provided in the base casting without disturbing the stack in any way. A set of contacts can easily be removed inside ten minutes. In order to obtain access to the interrupters on the higher ratings, a steel ladder and davit is provided which can be fixed to the side of the breaker. The main blast valves are located on the side of the receivers at the base of the main air column, so as to be easily available without disturbing insulators. All control valves, terminal boards and multicore cable glands are attached to the side of the breaker base, in weatherproof cabinets.



Test Oscillograms

Tests

As stated in our previous article, a wide range of tests were carried out on four representative sizes, the 275 and 400 kV breakers being in the form of single-pole units. Space does not permit of detailing all the results, but the accompanying oscillogram and figures giving the results of test C4 are typical. They represent three-phase tests using the top and middle gaps of the rear column only for an intended asymmetrical breaking capacity of 18·6 kA at 38 kV. Figures actually obtained are given in Table 1.

Line voltage	38·4 kV
Initial current peak	32·8, 32·6, 21·2 kA
RMS	14·0, 13·2, 13·6 kA
Power Factor	·05
Breaking Current Symmetrical	13·3, 13·0, 13·4 kA
Average RMS	13·2
Asymmetrical	17·3, 15·6, 13·5 kA
DC component	58%, 47%, 10%
Recovery voltage	— 39·8 34·9 kV
3-ph symmetrical MVA	797
Arc duration	2·0, 1·5, 2·0 half-cycles
Total break time	7·6 "

Observations: Moderate gas from coolers. Operation satisfactory.

Another Set of Letters

Education Ministry Report proposes New Certifying College

IN the past few years a number of reports have been issued dealing with industry's need for more, better trained scientists and technologists. Latest of those which suggest ways of fulfilling this requirement is a Ministry of Education publication, "The Future Development of Higher Technological Education," issued on Tuesday.

College of Technologists

This document is the first report of the 73-strong National Advisory Council on Education for Industry and Commerce, which meets under the chairmanship of Lt.-General Sir Ronald Weeks, K.C.B., and its principal recommendation is that a Royal College of Technologists should be set up, for the purpose of approving suitable courses of advanced technology submitted by technical colleges under conditions appropriate to first and higher awards. It will also, if founded, approve the appointment of suitable external examiners to assist the colleges in setting and marking their own examinations.

It is envisaged that the College will award Associateships (equivalent to a first degree), and Membership and Fellowships for those taking advanced courses and submitting theses.

It was emphasised that the report deals mainly with the development of courses on a full time, or sandwich basis. The changes in educational system and opportunities brought about by the higher school-leaving age, and the growing practice of part-time release for apprentices and students in works, have been kept well in mind.

With suitable safeguards as to basic education, the Associateship scheme might provide an opportunity for the man who has worked through the National Certificate courses to progress to a higher qualification without the retracing of steps needed to obtain a degree.

In a foreword to the report the Minister of Education, Mr. George Tomlinson, requests that the report should be widely studied and makes it clear that before taking any decision on the Council's recommendations he will welcome and consider any comments.

Essential requirements for technical college development to meet the requirements of a new award are considered in the report. These include the transfer of junior and less advanced work from approved colleges to nearby institutions, so that the former can concentrate on higher studies, and the provision of finance, staff and buildings to attract good students and the right kind of staff—those with high academic qualifications and a sound experience of industry.

Need for New Award?

The Associateship award is proposed as an inducement to the student to pursue approved courses at such institutions, and has been decided upon in preference to the award of a certificate or the conferment of a degree.

Not unnaturally, the Council has received suggestions that the existing system of awards is sufficient and satisfactory. Existing schemes of affiliations between Universities and technical colleges, the London External degree, professional institution qualifications and the award of bodies such as the City and Guilds of London Institute were all considered.

To affiliation suggestions, the Council replies that it doubts the willingness of colleges to co-operate. The external degree, it considers, does not give flexibility to colleges, while the award considered by the Council is no substitute for "professional" qualifications.

So far as the C. & G. examinations are concerned, the Council consider that they "tend relatively to impose restrictions on the content of the courses and the teaching of the subject associated with the award."

Conference Statements

At the Press conference held to present the report, it was stated that the new award might eventually lead to some alteration in Higher National Certificate courses, although its correspondence was more with the degree. What happened would depend largely on the court and council set up to govern the college.

For the proposed Royal College, it is planned to have a Court assisted by a Council and an Academic Board. The Council is to consist of 16 persons of eminence nominated by the Crown, four representatives of the Council when appointed, and four representatives of the Academic Board when appointed. Eventually the nominees of the Crown will be limited to four, the remaining twelve members being elected by and from Fellows and Members of the College, the representation of the Council and the Academic Board remaining the same.

The Future of Coal

Long Term Plan Prepared by N.C.B.

THE prosperity of an industrial country is largely dependent on the availability of cheap and abundant power. This in turn implies the availability at reasonable prices of the fundamental sources of power—coal, oil and water-energy. Consequently, in this country, the price of coal and the future prospects of the coal mining industry are vitally important factors. For this reason the publication by the National Coal Board of their "Plan for Coal" (available from the N.C.B., Hobart House, Grosvenor Place, London, S.W.1, price 2s. 6d.) is of widespread interest.

The Board intends to expend within the next fifteen years or so some £635 million in capital improvements, of which £520 million are earmarked for collieries and £115 million for "ancillaries," such as coke ovens, briquetting plants and the like. Extensive rationalising of production in many areas is visualised, the main production (70%) coming from 250 of the 970 collieries now in production. Many of the existing pits will either be amalgamated with others or, due to exhaustion of the seams, be shut down.

Power Supply

Although most of the report is naturally concerned with the future of coal mining as far as economic working of seams, labour relations, development of new pits and so on are concerned, an appendix gives some details as to the probable future power trends. At present the potential demand for power is about 1·8 million kW (the N.C.B. itself has plant with an installed capacity of 872,399 kW), but it is estimated that the future maximum demand will rise to between 1·9 and 2·5 million kW. As much of the present plant is old, and the majority of boilers comparatively inefficient, the N.C.B. suggests that more attention might be paid to pit-head generation, using comparatively small stations which would be designed to operate on the increasing quantities of inferior fuel. The absence of transport charges, it is thought, would largely compensate for the difficulties of burning low grade fuel economically, and as the collieries are already connected by rail, and have ample ash disposal facilities, the capital costs would be reduced. Against that can be put high labour costs for operation and increased capital costs for special boiler designs to accept low-grade fuels.

It is, however, estimated that the costs of generation, including capital charges, would lie between 0·5d. and 0·8d. per unit, depending on the ash content of the fuel. The stations would, of course, have to run in parallel with the Grid.

THE NORTH OF SCOTLAND CONTROVERSY

MUCH comment was caused in the lay press last week-end by a disagreement between the B.E.A. and the North of Scotland Hydro-Electric Board over the terms of a supply from the new Loch Sloy station. Sir Edward MacColl, vice-chairman of the North of Scotland Board stated that the disagreement was not concerned with price, but because the B.E.A. proposed to take only one-fifth of the output which was available from the two turbines at Loch Sloy.

In a statement issued by the Board on Saturday, it was pointed out that the amount of water available at Loch Sloy is limited to the natural catchment area of the loch. The Board offered to the B.E.A., as a temporary arrangement, an output up to the limit of the two turbo-alternators installed —60,000 kW and 300,000 kWh in one week. The Board proposed to the B.E.A. that the Sloy station should be operated for two hours per day on five days of the week—Monday to Friday.

Sir Edward stated that if the B.E.A. had flexible arrangements they could have in the space of a day or two the whole 300,000 units available. The Board's concern was to use the Loch Sloy station to the best advantage in the public interest. It had been suggested to the Authority that it would be better to see how the Sloy sets could be fitted in with the other plant in Central Scotland rather than adopt an attitude which may well have the effect of depriving Scottish consumers of the much-needed relief which this station could afford.

On January 1, 1951, the Board come under an obligation to implement a contract made with B.E.A. under the aegis of the Act and will be required to supply 100,000 kWh per day from all sources. The Board reserve the right to determine how much power is to be delivered from Sloy. Deliveries from the North of Scotland grid will be made at three points—Windyhills, Bonnybridge, and Abernethy.

In a subsequent statement by the B.E.A., the Authority emphasised that they were satisfied that if they took the supply allocated to them by the North of Scotland Board for the week at the rate at which the Board wanted to deliver it, the supply would be exhausted in ten hours, which, in seasonable weather, would cover five hours during the peak periods each day for only two days of the week. The Authority would have preferred to distribute the supply over the peak periods during the whole week.

Nevertheless, as these were the only conditions under which the Scottish Board would offer the supply, the Authority had decided to accept them rather than deprive the people of the electricity.

Problems and Practice

IN ENGINEERING

Grounded versus Ungrounded Neutral Operation

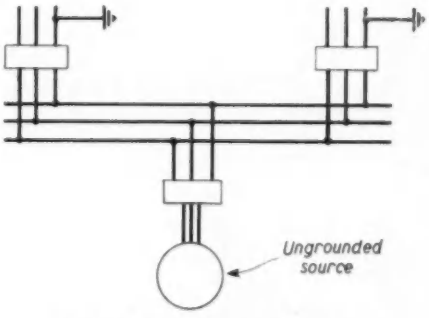
THE main advantage to be gained by operating with an ungrounded neutral is that a line to ground fault involves only a small capacitance current and consequently does not necessitate a circuit outage. This applies to small systems, where generally, operation with ungrounded neutrals is satisfactory.

However, as systems grew larger and higher voltages were employed, increased charging current with greater damage at the point of fault resulted. Consequently, the advantages of the isolated neutral gradually disappeared.

The disadvantages associated with ungrounded circuits are:—

(*a*) High transient over-voltages are initiated during ground fault interruption or upon the occurrence of arcing grounds. The magnitude of these over-voltages may be as much as five or more times normal line to neutral voltage.

(*b*) These transient over-voltages may cause failure on circuits other than the faulted one, thus resulting in additional damage and interruption.



Earths on ungrounded supply system

(*c*) A line to ground fault on an ungrounded system results in full line to line voltage appearing between ground and the unfaulted phases. This is 73% greater than the normal line to ground voltage. Usually, line to ground insulation will withstand this voltage but with the fault allowed to persist for protracted periods, failure may result especially if the insulation has become aged or is subject to vibration as in rotating machines.

(*d*) The occurrence of a second ground fault on another phase, before the first has been cleared, creates a phase to phase short circuit. The large current now involved may cause great damage to associated equipment which could have been avoided upon the removal of the initial fault. Referring to the sketch should the second fault occur on another phase both circuit breakers may trip causing a double outage.

In view of the voltage strains imposed on various equipment during ground fault interruption and considering that (*a*) accidental grounds are usually arcing and (*b*) the largest percentage of faults are grounds, it becomes desirable to remove ground faults as soon as they appear. However, the small currents usually involved are not sufficient to operate ground relays and protection by this means becomes complicated.

Coming now to the subject of grounding, it may be said that grounding of the neutrals of Y connected generators and systems is today the general practice.

The chief reasons for grounding neutrals are: (1) the reduction of high transient over-voltages to safe values, thus reducing voltage stresses on equipment; (2) the provision of a definite ground current to operate protective relays.

From the point of view of generator protection, it is very desirable to ground the neutral so that a line to ground fault can be detected by the protective relays and the generator disconnected from the line before a phase to phase short circuit can develop.

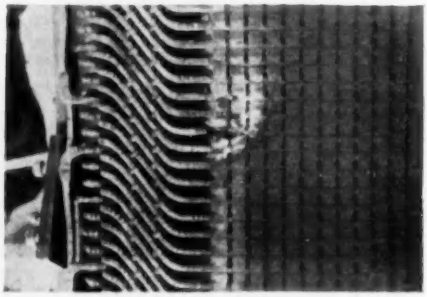
Grounding the generator neutral solidly results in tremendous mechanical stresses being imposed on the windings when a ground fault occurs. Moreover, much damage may result due to the high value of the fault current because, with a solidly grounded neutral, a line to ground fault results in a greater current than a 3-phase fault. In some cases, severe burning of the stator iron has resulted, necessitating re-stacking part of the core.

It is usual to ground the neutral through some form of impedance in order to limit the line to ground short circuit current to values which will ensure the satisfactory operation of the protective relays.

Generator neutrals are commonly grounded through a resistance and, with the ohmic values generally met with in practice, the line

to ground voltages during a line to ground fault will be nearly the same as for an ungrounded system. The transient over-voltages will, however, be held down to about 2·5 times normal line to neutral voltage which, in the case of 11·5 kV generators will be approximately 70% of the standard generator test voltage when new.

The amount of ground current that is acceptable varies in practice. Values given are 5 to 10% of the 3-phase fault current and also, from a minimum of 100 amps to a maximum of 1·5 times the normal rated current.



Damage to stator iron resulting from high current during line to ground fault

Universally, some form of differential protection is used for generators, combined with overload relays. The operation of such protective gear is dependent upon the voltage and the impedance of the circuit through which it must work.

Any impedance in the generator neutral increases that portion of the winding wherein ground faults will not cause the differential relays to operate. To obtain protection, therefore, of the greater portion of the winding, the value of ground current recommended is 100% of the highest primary current rating of the current transformers used for the protection.

For example, if the current transformer ratio is 1000/5 the neutral resistance should be rated at 1,000 amps. The normal voltage dividend by this current determines, for practical purposes, the ohms required in the resistance.

Thus, for a 11·5 kV generator, the line to neutral voltage is 11500/1·73 or 6,650 V and the required resistance is 6650/1000 or 6·6 ohms.

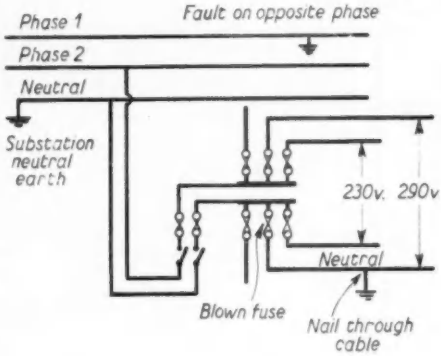
Reactors are sometimes employed for neutral grounding but generally some careful study is required before applying them. Usually, for systems rated at 15 kV and below, resistance grounding proves satisfactory.—*John W. A. Williams, Newfoundland.*

Live Neutral

I WAS recently called to a house where it was reported that some of the lights had suddenly grown so bright that they had to be switched off.

My first impression was that probably the lights were just flickering, due to a local fault. This was soon dispelled, however, when a voltage check showed the one circuit to be very unstable, but at times reaching 290 volts. The other two circuits were quite stable at 230 volts.

The fuses were checked, and the neutral fuse on the faulty circuit had blown. This was due to a nail having been driven through a cable in the house—normally, of course, this would have gone unnoticed, but there was also a very heavy fault on the heating circuit of a hotel nearby. As this fault was on the opposite side of a split-phase system, a voltage as high as 60 volts had been imposed on the neutral fuse that had blown.



Circuit connections leading to varying voltage

The fault was rectified by isolating the defective circuit in the hotel and ordering its repair. The neutral fuse in the house was repaired and the circuit ordered to be repaired forthwith.

A single pole house wiring system as now recommended would have prevented the high voltage which had occurred from phase-to-earth as distinct from phase-to-neutral.—*M. H. Berry.*

Contributions to this page dealing with specific items of interest to electrical engineers and maintenance men are welcome, and, if accepted, will be paid for at our standard rates. Contributions should be written on one side of the paper only and may be accompanied by sketches, which will be re-drawn for publication.

France expands her power supply

Director of Equipment reviews Engineering Plan

FRANCE since the war has been working to an electricity supply expansion plan that should give an annual output of 32,000 million kWh by 1952. Engineering considerations taken into account in arriving at this figure were discussed by Mr. R. Giguet (Director of Equipment, Electricité de France) in a lecture delivered at the City and Guilds College last week.

At present France generates only 750 kWh/year/head of population, against 900 in Great Britain and about 2,000 in the U.S.A. Half of this energy comes, in normal years, from hydro stations, and much of the development planned involves making use of water power. As a start of planning, a "guarantee" had to be decided on, taking into account available rainfall and river flow data, and recent droughts have caused the plan to be biassed in favour of more thermal stations. For 100% output certainty, the possible thermal output would have to equal the peak load, but this would be uneconomic.

For the plan, it is essential that the low-quality coal which France produces should be used, and that blast furnace gases which are available in the iron-producing areas should be burned in local stations, the furnaces having to burn coal as well, as the supply of gas is irregular.

Generation Schemes

The hydrology and physical form of France do not offer the opportunities for water power existing in some countries. The Massif Central has a heavy rainfall and suitable storage basins, but the schemes need long induction tunnels, and are more dependent upon immediately recent rainfall than snow regulated projects. The Monnet plan provides for reservoirs upstream where possible, so that both high head and stream-flow stations can be operated. The Alpine schemes will generate 3,500 million kWh, Massif Central 3,100, Pyrenees 1,700, and Rhine, Rhône and Jura 4,500, giving a total expected output when the plan is realised of 12,800 million kWh/year.

In the case of the thermal scheme, large capacity stations are being erected to give better efficiency and high reliability. To provide the necessary "guarantee" against partial failure, due to drought, of the hydro schemes, a total of 1,450 MW increase in installed capacity is planned. This will be split as follows: 600 MW in the northern districts, 400 MW in Lorraine and the Lower Rhine area, and 450 in the Central and South mining districts. In connection with stations working on blast furnace gas, a pipe line grid is being laid down to connect the furnaces to the stations. This last project is being delayed for various reasons, but the building and installation of the power stations is well advanced. Probably the total installed capacity of thermal stations will be 5,500 by the end of the plan.

Transmission and Distribution

Electricité de France has to erect long transmission lines to link generating centres with load centres. Transmission voltages of 380 and 400 kV are being investigated, existing lines being designed for 150 and 220 kV; 1,707 miles of such lines have been erected in the three years 1947, 1948 and 1949.

The medium voltage transmission and distribution networks have to keep pace with other schemes, but owing to their comparatively robust nature reinforcement is repeatedly delayed for financial reasons. Accidental stoppages and big frequency drops result, and some determined action will have to be taken soon.

M. Giguet finished with a survey of the financial background of the expansion programme, in which he paid tribute to U.S. help through Marshall Aid, and with a forecast of the future.

Finance

It is difficult to estimate the financial cost of this scheme for electrical expansion, since the value of the franc has altered appreciably during the progress of the work. Adjusting for this, however, the estimated costs of the various phases of the scheme are, up to the end of 1949, in millions of francs: hydro-electric stations, 190,000; thermal stations, 40,000; transmission lines, 36,000; distribution schemes, 23,000 francs. Additional sums to be spent later are 265,000; 30,000; 45,000; 70,000 millions of francs respectively.

At the end of the Monnet plan, expansion of electricity production will still be needed, and the French manufacturing industry will be able to back the requirements up to 600 MW of thermal plant/year, with 2,500 million units/year as the total hydro-electric capacity.

overseas news

Aswan Dam Project

The Egyptian Government is again seeking tenders for the civil engineering and ancillary work in the construction of the hydro-electric power station at the Aswan Dam. The specifications, conditions, etc., will be available early next month. It will be recalled that the Government put out their original inquiry on the project some months ago, but this was subsequently cancelled. No closing date has yet been announced.

S.A. Rural Distribution

The Electricity Supplies (Country Areas) Bill passed the second reading and committee stages without amendment in the South Australia Legislative Council last month. The measure, which has been approved by the House of Assembly, makes provision for further supplies of electricity to the sparsely-settled areas of South Australia by the appropriation of £1,000,000 out of general revenue and by the granting of subsidies to municipal and district councils. In the debate on the Bill, most speakers applauded its aims, for neither the Electricity Trust nor the district councils concerned with the towns supplied could ever hope to stand up to the liability of supplying sparsely-populated areas, or even hope to stand up to the liability of the heavy capital cost involved. One member, however, thought that the Bill would cause some heartburning when it came to an interpretation of "sparsely" populated areas. The Chief Secretary (Mr. McEwin) closing the debate, said that the word "sparsely" was meant only from the point of view of the application of electricity distribution, and that any project would be examined by experts.

Australian Sales Tax

Under a recent amendment to the Australian Sales Tax, electrical fittings, accessories and materials used in consumers' electrical installations are now exempted. This exemption, however, is not extended to bells, burglar or fire alarms, lighting fittings, condensers, convertors, starters, transformers, flexible cables, generators, neon signs and other luminous discharge lighting equipment, and electrically operated appliances, apparatus and machines.

Queensland Extensions

The State Electricity Commission of Queensland has approved a rural electricity extension programme by the Dalby Electric Authority which is estimated to cost £48,400 and which will carry a 50% Government subsidy. Extension of power lines to serve farmers close to Dalby is expected to cost £14,000 and to serve farmers on the Warra-Jandowae Road £8,600, and on the Apunyal-Pirrinuan Road, £8,000. An extension to Upper Koondai-i will cost £10,000. Branch Creek and Goombi areas also will be served.

Balmain Co. Acquisition

Under the amendment to the Electricity Commission Act, to which we referred on November 2, the new Bill provides for the transfer of control of the Balmain Electric Light and Power Supply Corpn. Ltd., as from November 1, 1950. It also provided for the acquisition by the Electricity Commission of New South Wales, of the Parramatta and Granville Electric Supply Co. Ltd. Introducing the measure, the Minister for Local Government, Mr. Cahill explained that negotiation for the acquisition had been conducted and while a large measure of agreement was reached except on the question of price, there were certain difficulties in proceeding under the existing legislation. One was that a sale by the companies of their undertakings would have necessitated distribution to shareholders on dissolution. Such payment to shareholders would have placed a heavy burden of taxation on the shareholders. He said the Electricity Commission Act, 1950, directed the Commission to negotiate with the two companies to acquire them. Another reason for the introduction of this legislation was that after the formation of the Commission the Government appointed the general manager of the Balmain Company, Mr. H. G. Conde, as chairman of the Electricity Commission. To allow Mr. Conde to wind up his affairs and to protect his substantial superannuation rights with the company, the Governor, with the advice of the executive council, approved of him retaining temporarily his position as general manager of the company. Mr. Cahill said that, although this permission was temporary, it had caused criticism of the Government. This Bill was an answer to such criticism. The action was being taken with the full agreement of the companies, as it was realised this was the only reasonable and practicable solution to the problem.

Expand Leigh Creek Production

The new power station at Leigh Creek coalfield is to start operating this month, the acting general manager and chief engineer of the Electricity Trust of South Australia, Mr. L. J. C. Wigan, announced recently. The small diesel station now supplying the township and open-cuts on the field is to be closed. The whole of the area will then be supplied with electricity from the power station being erected on the north field. Boilers have been modified to burn Leigh Creek coal. The large capacity of the new station will provide enough power to operate the drag-line excavator now being assembled in the coalfield, and will enable production to be stepped up.

Acquisition Proposal

Future ownership of the Prince Albert power plant was discussed last month, when the city aldermen entered into negotiations with officials of the Saskatchewan Power Corporation.

The city is attempting to either purchase the plant or negotiate for a short term agreement. Last July the Light and Power Committee advised the council to take over the operation of the generating plant. The local power plant was sold by the city to Canadian Utilities, Ltd., in 1931, for $875,000. According to the contract drawn up at that time the terms of agreement were to be considered every 10 years. These terms between the owner of the plant and the city still stand, although no action was taken at the end of the first 10-year period in 1941 or when the plant was transferred by the utility company to the Power Corporation.

More Plant for Toronto

An order for two more 100 MW turbo-alternators for the Hydro-Electric Power Commission's new station in Toronto has been placed with C. A. Parsons & Co. Ltd. These are to be in operation by 1953. Two similar units, already ordered, are in an advanced stage of construction, and are to be operating by November 1952.

Quebec's Claim

The hydro-electric power reserves of the Province of Quebec, if fully developed and exported in a larger measure than at the present time, would mean increased prosperity for the province, stated Dr. Huet Massue, engineer-economist for the Shawinigan Water and Power Co., addressing the closing session of the 10th annual convention of the Institute of Power Engineers at Montreal recently. He considered that the present output of 6,000,000 h.p. of electricity in the Province could at any time be increased to 12,000,000 h.p. He claimed that Quebec has probably the lowest power rates in the world.

Power Needed

In view of Ontario's urgent need for additional energy, Mr. R. H. Saunders, chairman of the Hydro-Electric Power Commission of Ontario, has again asked the Canadian Government to allow work to be started next year on the St. Lawrence power project, in order that it may be completed by 1956. A further request is to be made to the U.S. Government.

German Power Exchange

The exchange of electric power between the British and Soviet zones, at the rate of 20,000 kW a day, is being resumed today (November 16). Hamburg power-station will supply certain districts in the Soviet zone and ...ations in East Berlin will again supply the ...estern sectors.

Britain-Denmark Cable

The work of laying the co-axial cable from Weybourne, Norfolk, to Fanoe, near Esbjerg, Denmark, has now been completed, the Great Northern Telegraph Co. has announced. The cable, which is claimed to be the world's longest co-axial cable, will enable 24 messages to be sent in each direction simultaneously and this number can be doubled. The 350 miles of cable used was made by Submarine Cables, Ltd., at Greenwich, and it was laid by the British Post Office cable ship *Monarch*.

Development

Electricity came to Shab Kadar Fort, an important trade centre on the Mohmand border of northern Peshawar, when the chief Minister of the North-West Frontier Province performed the inauguration ceremony last week. This was the seventh major extension of the Malakand hydro-electric system since the birth of Pakistan.

Electrification of the Free State

A deputation representing seven northern Free State municipalities and village management boards recently met the Minister of Lands, Mr. J. G. Strydom, to discuss the possibility of establishing a hydro-electric power project at Vaaldam. The municipalities and village management boards were Petrus Steyn, Edenville, Heilbron, Oranjeville, Deneysville, Villiers and Cornelia. The annual congress of the Central South African Regional Development Association, which had earlier ended in Bloemfontein, passed a resolution urging the Government to consider such a scheme. At the latter congress it was agreed to urge the Government to include an electrification scheme for the eastern Free State in its estimates of expenditure for the next financial year. Such a scheme was discussed with the Electricity Supply Commission of South Africa in 1948.

Plant for Queenstown

Faced with the prospect of introducing rationing of electricity, Queenstown Town Council, Cape Colony, has decided to purchase another boiler which will enable standby plant at the power station to be used to the extent of 400 to 500 kW. Some time previously the Council had considered the report of its consulting engineer, Mr. J. S. Clinton, in which he recommended the installation of an interim diesel power plant costing £37,400, but the Council instructed him to find out whether it would be possible to obtain alternative steam-raising plant. He obtained an offer of a Lancashire type boiler, the cost of which, with ancillary equipment, building work, etc., would amount to £10,340. This offer has now been accepted. It was anticipated that the Council would operate the plant for about two years, after which its secondhand value might be in the neighbourhood of £4,000.

PERSONALITIES

IN THE INDUSTRY

Increasing their sales staff, Santon Ltd. have appointed **Mr. D. Whynes** as an additional sales representative attached to their London office **Mr. R. L. Moss** has also been appointed as sales representative in London, replacing **Mr. S. Dvorjetz,** who has been promoted to manager of the Birmingham office. In addition, **Mr. F. G. Robinson,** formerly of the Birmingham office, is taking up a new appointment at head office and will be responsible for the development of industrial sales.

Previously their chief estimating engineer, **Mr. G. W. Heslett** has now been nominated manager of the Pump Department of Sulzer Bros.(London).

Chosen as deputy power station superintendent for the new Agecroft h.p. generating station in the North-Western Division, B.E.A., is **Mr. H. F. Clamp,** who has been boiler house superintendent at the Kearsley power station in the same Division. The new Agecroft station which now houses two 52·5 MW sets installed, will have an ultimate capacity of 210 MW.

Mr. H. F. Clamp

The Metropolitan-Vickers Electrical Co., Ltd., have made three new appointments in their general engineering department. **Mr. F. B. Holt,** A.M.I.E.E., is now assistant chief engineer (industrial), with **Mr. D. R. Love,** B.SC., A.M.I.E.E., M.A.M.E.M.E., as assistant chief engineer (mining), and **Mr. W. J. Price,** B.SC. (ENG.) as assistant chief engineer (power). Mr. Holt started with the British Westinghouse Co., in 1902, and after specialising in switchgear became chief draughtsman of the switchgear apparatus section in 1913. From 1917 to 1920 he was chief draughtsman of the Control Dept., and after being responsible for setting up a new motor test bed, joined the motor application section of the Motor Dept., which later became the industrial section of the General Engineering Dept. He was nominated chief textile engineer in 1920, and placed in charge of the Section in 1937. Mr. Love, whose college apprenticeship at M.-V. was interrupted in 1939 by the war, returned to Trafford Park on demobilisation, and in November, 1946, entered the mining division of the General Engineering Dept. Mr. Price, too, completed a college apprenticeship, and later joined the power and general division of the General Engineering Department.

Two new appointments are announced by Elexcel Ltd. **Mr. J. E. Thorneycroft** has been nominated as representative for the area of the East Midlands Electricity Board, and **Mr. P. G. Payne** to a similar post covering the Midlands Electricity Board's area. Mr. Thorneycroft was for approximately twenty years with the Hotpoint-B.T.H. organisation, and was latterly sales representative for Falco Electrical Appliances Ltd. Mr. Payne has served for over twenty years with the Birmingham electricity undertaking, and he will now operate from Elexcel's new office at 55 Cornwall Street, Birmingham, 3.

Mr. P. G. Payne

For 20 years with the English Electric Co. Ltd., **Mr. W. G. Hobson** has been appointed assistant transport superintendent to Launceston City Council, Tasmania. He has had considerable experience in the installation of trolley bus services in Great Britain.

Mr. F. B. Holt

Mr. D. R. Love

Mr. W. J. Price

On his world business trip, **Sir George Nelson,** F. C. G. I., M. I. Mech. E., M.I.E.E., chairman and managing director of the English Electric Co. Ltd., is now in Australia and plans to visit New Zealand and India before returning to this country. While in Australia he visited the associated company's Rocklea factory.

Retiring recently for reasons of ill health, **Mr. T. M. Blackburn,** district manager, Halifax district of the Yorkshire Electricity Board, No. 2 Sub-Area, has been presented with a portable radio set subscribed for by colleagues. Mr. Blackburn joined the Halifax undertaking over forty years years ago, and between 1923 and 1927 was with the Yorkshire Electric Power Co. Returning to Halifax, he became mains superintendent in 1931, and later successively held the positions of distribution engineer and deputy manager. During an interval when Mr. G. A. Vowles left for Ipswich in 1939 and when Mr. A. G. Connell left two years ago for the East Midlands Board, Mr. Blackburn acted as manager. On nationalisation he was nominated local manager, and later, district manager.

Mr. T. M. Blackburn

Mr. S. J. L. Hardie, has resigned the chairmanship of the board of the British Oxygen Co. following his appointment as chairman of the Iron and Steel Corporation of Great Britain. **Mr. J. S. Hutchinson** has been elected chairman of the British Oxygen Co. in his place and Messrs. **F. C. S. L. Lewin-Harris** and **Mr. J. L. Hardie** have been appointed to the board.

This month **Mr. G. W. Alexander,** B.SC. A.M.I.E.E., A.M.I.Min.E., has taken up his new appointment as chief engineer of Powell Duffryn Technical Services Ltd. **Mr. Ivor Williams,** who has been acting as chief engineer of the company, will in future be chief consulting engineer. Mr. Alexander was previously chief engineer of the Mining Department of the Metropolitan Vickers Electrical Co., Ltd. He had been in charge of that Dept. since mid 1947, succeeding Mr. H. Watson-Jones. He served a college apprenticeship at Trafford Park, and in 1933 joined the engineering side of the Mining Department. During the war he was seconded to the M.V. Special Contracts Dept.

Mr. G. W. Alexander

At the end of this year **Lord Reith** will relinquish his chairmanship of the Commonwealth Telecommunications Board, on being appointed chairman of the Colonial Development Corporation.

As from the beginning of this month, **Mr. P. J. Cason** ceased to represent the Sloan Electrical Co., Ltd., in the South Wales area.

The chairman of the General Council of the Engineers' Guild for 1950-51 is **Mr. Henry Nimmo,** M.Inst.C.E., M.I.Mech.E., M.I.E.E., chairman of the Southern Electricity Board. Vice-Chairman of the Guild is **Mr. W. S. Graff-Baker,** A.C.G.I., B.SC., M.I.Mech.E., chief mechanical engineer (railways) London Transport Executive.

Mr. H. Nimmo

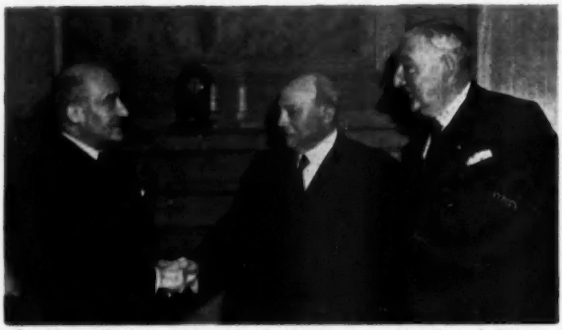
Mr. Nimmo is also president of the Batti-Wallahs' Society, and a past president of the A.S.E.E., apart from serving on many other technical bodies. The General Council of the Guild recently elected **Mr. R. Chalmers,** O.B.E., to be the first president of the Guild. He was for 20 years with the London County Council, latterly as senior divisional engineer in the chief engineer's dept., from which position he retired recently.

It is announced by the Institution of Electrical Engineers that they have awarded the I.M.E.A. Research Scholarship of £420 a year to **Mr. Colyn G. Morgan,** M.SC., for the prosecution of research in the Department of Physics of the University College of Swansea.

Newly appointed sales manager of William McGeoch and Co., Ltd., is **Mr. B. I. Powell,** pictured here. He has had previous connections with the contracting and generating side of the industry, and for a time served in the Electrical Branch of the R.N. For some years he was Midland area and branch manager, and has become well known in that territory. He is a member of several clubs, including the Birmingham Electric Club and the Engineers' Club.

Mr. B. I. Powell

His many friends in the industry, will be interested to hear that **Mr. S. Ferguson,** M.I.E.E., who founded Cooke and Ferguson Ltd., in 1937, has resigned his position as chairman of the board of directors of that company in order to devote more time to his other interests. He remains a director and available for consultation and special assignments as may be required. **Mr. T. H. Windibank,** M.I.E.E., director of Crompton Parkinson Ltd., is now a director and chairman of the board. **Mr. J. R. Ferguson,** son of Mr. S. Ferguson, has been a director since 1937, and general manager since January 1948, a position he still holds.



Sir Harry Railing greets Mr. S. H. Cass and Mr. F. A. J. Ryde

Our accompanying illustration shows **Sir Harry Railing,** chairman and joint managing director of the General Electric Co., receiving **Mr. S. H. Cass** and **Mr. F. A. J. Ryde** who recently retired, both having completed half a century with the company. Mr. Cass, seen shaking hands with Sir Harry, joined G.E.C. in 1900 in the Bought Ledger Dept., transferring to the Wire and Cable Dept. in 1916. He later became senior assistant to Mr. Lewis Smith, manager of Wire and Cable Dept. Mr. Ryde joined the Company in 1899 and after 14 years in the Wire and Cable Dept. became manager of the Co's Cable Stores at Southampton in 1916.

New appointments to the Electricity Consultative Councils have been made by the Minister of Fuel and Power. In the London Council, **Mr. Douglas S. Young** succeeds the late Mr. F. C. Polden. New members of the South-Western Council are **Mr. W. R. Grose,** M.A., **Mr. W. F. Long, Lt.-Col. J. Ramsden, Mr. F. T. Upton, Mr. C. R. M. Frost,** and **Dr. W. G. Hiscock.** A new member of the South-East Scotland Consultative Council is **Brig. J. C. Cunningham.**

Following the retirement of **Mr. J. A. Smith,** the number of directors of Plessey International Ltd. has been increased to five. In addition to **Mr. A. G. Clark** and **Mr. J. F. Mallabar, Mr. B. G. W. Attwood, Mr. E. J. Earnshaw** and **Mr. T. White Wilson** have been appointed to the board.

The Telegraph Construction and Maintenance Co., Ltd., announce that **Mr. J. H. Barham,** A.I.E.E., has been appointed Midlands representative, covering the areas of the Midlands Electricity Board and South Wales Electricity Board, and **Mr. F. J. Walker,** has now been appointed East Midlands representative, covering the area of the East Midlands Electricity Board and the Norfolk, Suffolk and Fens Sub-Areas of the Eastern Electricity Board.

OBITUARY

We note the death, on November 2, of **Mr. A. W. Pannell,** director of Edstone Ltd., and for many years export manager of the Plessey Co.

The death occurred on November 5 of **Mr. S. C. Bunn,** M.I.Mech.E., M.I.E.E., F.Inst.F., who had been assistant electrical engineer at the Lots Road generating station, London Transport Executive, since 1940. He went to Lots Road in 1930 as boiler house engineer, holding that position till 1935, when he became resident engineer.

The death occurred on November 7 of **Mr. L. Levy,** aged 73, formerly chairman of George Cohen, Sons and Co. Ltd., and chairman and managing director of New London Electron Works.

I.E.E. MERSEYSIDE DINNER

ABOUT 160 members attended the annual dinner of the I.E.E. Merseyside and North Wales Centre held in Liverpool on Monday, with Mr. J. Eccles, C.B.E. B.Sc. in the chair.

In proposing the toast of "The Institution of Electrical Engineers," Lord Citrine mentioned his own connection with Merseyside and the early days of his apprenticeship there. Mentioning his desire for co-operation between the I.E.E. and the B.E.A., he thanked the Institution for help already extended, and paid tribute to the President. Referring to the B.E.A., he said that the problems facing them were not of their own making and many could be overcome by an expansion of manufacturing capacity. He then reviewed the generating plant situation, and the foreseeable future, including the possible contribution of wind power, atomic energy and tidal power, pointing out that present coal consumption of 30 M tons would, it was estimated, be doubled in the next ten years. Sir Archibald J. Gill, in reply, mentioned the work done by the I.E.E. and its increasing importance to the community with the rapid growth of electric power.

"Our Guests" was proposed by Mr. T. B. D. Terroni, B.Sc., in a brief and witty speech. Responding, the Lord Mayor of Liverpool (Alderman Rev. H. D. Longbottom, J.P.) emphasised the importance of the consumer. Successive effort must be concerned with the result to homes. The change-over from private ownership to a nationalised body still left many problems requiring rectification. Referring to Lord Citrine's speech, he pointed out that although present problems had not been created by the B.E.A. there should be no cause for self-satisfaction, when it was considered that in the old days representatives had to sell whereas nowadays people were employed to tell the consumer what he could not have.

This importance of the consumer was also stressed by the chairman in his concluding address.

Install for Reliability!

I.E.E. Utilisation Section considers Problems of Large Chemical Plants

LONG running periods without shutdown and a high overall load factor are the outstanding characteristics of electrical machinery in chemical plants. In designing installations for such duty, two physical factors have to be kept in mind as well—the area of the factories is large, with many widely separated buildings, and the requirements of production make necessary frequent additions and alterations to buildings and electrical systems.

These considerations provided the background for a paper, "Some Notes on Electrical Installations in Large Chemical Factories," which was read by MR. D. B. HOGG, M.B.E., M.I.E.E., (I.C.I.), before the I.E.E. Utilisation Section on Thursday last. As the title suggests, Mr. Hogg's remarks were mainly concerned with details of technique and plant so that an adequate summary in the space available here is impossible. Reliability stands out as the important criterion on all matters, since the cost of the electrical equipment for the distribution system, power, wiring and lighting in the factory is only about one-twentieth of the overall plant cost "and the use of new and untried apparatus may jeopardise much plant and lead to costly stoppages."

Main Distribution

Dual supplies should be ensured for all substations, and where possible the cables should be kept above ground. Economies have been obtained by situating 11 kV switchhouses in the run of h.v. ring main cables, and supplying several transformer substations from each through radial feeders. Where 3·3 kV as well as 440 V supplies are required, triple wound transformers are used. In nearly all cases, transformer size is limited by the need to keep fault prospective MVA down, and outdoor types of transformer are used. Savings in maintenance justify the additional first cost.

Main cables are p.i.l.c.s.w.a. & s., aluminium painted to promote cool running in sunny conditions. As with transformers, short-circuit considerations usually decide rating, this time the heating on through currents being the determining factor.

Where conditions are clean and non-hazardous, normal techniques can be followed. With power cheap, fluorescent lamps may not be justifiable; mercury lighting is particularly valuable in high buildings where colour discrimination is of no importance. Where it is used some tungsten lighting is included as a safety measure against temporary extinction due to voltage surges.

Conduit installations are disliked, condensation troubles and inflexibility being the drawbacks. Wire-armoured v.i.r. and m.i.c.c. cables are the accepted alternatives, the latter scoring when runs are easy and long. In all cases, cables entering motors, lighting fittings and fuseboxes are glanded to prevent the entry of moisture by the cable route. Fuses are of the h.r.c. cartridge type, often with low (1·4) fusing factor and inherent time delay. Motors, in most cases, can be of squirrel-cage design, and these are direct started in sizes as large as 500 b.h.p. Oil-immersed starting gear has largely been replaced by air break types.

The paper concluded with a review of the difficulties arising in dangerous atmospheres and in those which are strongly corrosive, and with a whole-hearted plea for standardisation within plants.

DISCUSSION

MR. C. F. FREEMAN (Courtaulds) opened the discussion with a large number of comments on individual points. With reference to the use of high reactance transformers to keep down short-circuit currents, he thought that if the effect of regulation on lighting was a worry, separate lighting transformers should be provided. Transformers were extremely reliable, and the improbability of their failure should be borne in mind in planning. Few spares and little protective gear could be an advantage.

Fluorescent lighting was usually worth while economically for three-shift working, broke even for two-shift, and was not justified on a pure cost basis for single shift factories. M.i.c.c. he thought most suitable for tortuous runs, though it needed rating generously. In deciding whether to install variable-speed motors, the proportion of running time at low speed should be the criterion. Totally enclosed, fan cooled s.c. motors gave the best service. Flameproof gear was at present too heavy for industrial needs, and test authorities should get away from the idea of exclusively "mines use."

MR. H. W. SWANN (Factory Inspectorate) endorsed the choice of pressurisation as a way of treating substations in dangerous situations. He asked about the earthing arrangements of l.v. and h.v. systems, stressing the danger of fires arising from a common earthing system. Periodic stabilisation of prospective fault currents also

attracted his attention. He suggested that corrosion of structural steelwork might come from primary cell effect, due to the chemical content of the soil.

MR. G. E. SKILLINGTON (Lever Bros.) thought that if the danger of chemical attack could be countered, there was much to be said in favour of burying cables, as was done in almost all large factories. Regarding motors, he thought that the slip-ring motor with a continuously rated rotor controller was too sensitive to load changes to be satisfactory for variable speed use.

Direct-on-line starting had many advantages, but the shock produced on shaft keys and gearing should be borne in mind. Totally enclosed, fan-cooled motors were best for use in dirty conditions. Non-metallic wiring systems were best for corrosive positions, while for portable tools and lighting step-down transformers should be incorporated in the leads. He agreed about the unnecessary heaviness of industrial flameproof gear.

Mr. A. N. D. KERR questioned the author's recommendation of vacuum-impregnation for motors, and mentioned that some Continental manufacturers were producing fan motors with no impregnantion, only solid insulation. With totally enclosed motors a weakness was their breathing in of contaminated air, with subsequent condensation of moisture, etc., inside the casing. He supported the proposal that industrial users should set up their own testing station for flameproof gear.

MR. F. C. FUKE approved the author's explanation of unexpected blowing of cartridge fuses as due to unequal current sharing between parallel elements.

SIR HENRY CLAY (McLellan and Partners) said that he was proposing to have direct-on-line starting for a 13,000 h.p. motor. Speaking of protective gear, he did not approve of leaving motors with only a stop-button to ensure isolation. He suggested also that white paint was better than aluminium to ensure cool running of cables and transformers. To overcome breathing and condensation troubles in totally enclosed motors, he advocated drilling a hole in the bottom of the casing to allow drainage and prevent breathing through glands.

MR. G. E. L. REDMAN (Pyrotenax Ltd.) thought that m.i.c.c. cable was most useful on tortuous routes. Generally speaking, copper gave excellent service in corrosive conditions. Where inductive apparatus gave voltage surges, it was worth remembering that the 660 V cable was tested by the application of 3 kV for one minute.

MR. J. F. SHIPLEY (Mackness and Shipley), speaking of gasworks experiences, agreed that in such circumstances as the author described it was most difficult to put any electrical plant or cables underground. He regretted that 3·3 kV switchgear, non-flameproof but suitable for mines use, was not available.

MR. R. O. ACKERLEY said that the heaviness of flameproof gear designs was linked up with test requirements, and he supported the formation of some testing station specifically to look after the requirements of industry.

MR. J. M. GOODALL (B.T.H.) mentioned that during the war a large industrial system had been erected with a solidly connected 440 V system fed by 500 kVA transformers on a ring main, with h.r.c. cartridge fuses as short-circuit protection at junction points.

The AUTHOR replied at some length to questions raised in the discussion.

Oil Refinery Installation

EQUIPMENT availability rather than money was the governing factor in a project described by Mr. G. D. Arden (Chairman, I.E.E., Western Centre) in his inaugural address. He spoke on the electrification of an oil refinery, which was complicated by the need of keeping prospective short circuit currents within the breaking capacities of Buxton certified switchgear. A maximum demand of 20 MVA has to be catered for, and the use of reactors for current limiting is ruled out on grounds of cost and complication.

The general scheme adopted calls for a radial 11 kV primary distribution system, controlled from one central point. At local load centres there are to be a number of standard substations equipped with flameproof gear, and local feeders from these substations will feed various plants in the immediate vicinity.

As no 11 kV flameproof switchgear is available, the central control gear must be in the "safe" area, free from inflammable vapours, and the feeders directly connected to their respective transformers. At 3·3 kV, the breaking capacity of available flameproof gear is only 25 MVA, and at 440 V, 5 MVA. To keep currents down to these figures, the largest transformer capacity in any section must not exceed 2·5 MVA at 3·3 kV, and two 1·25 MVA 11/3·3 kV units in parallel are standard, each having 10% reactance. For local distribution, two 3,300/440/250 V, 250 kVA transformers in parallel are used, with 6% reactance units. The duplication of transformers is necessary to facilitate maintenance in the absence of shutting down the plant; any ring main system would entail switchgear of a higher rupturing capacity than is available.

Motors from 50 h.p. to 400 h.p. are direct-on-line started on the 3·3 kV system; above 400 h.p. slip ring motors are installed. Motor starting switchgear is assembled on continuous boards in a separate switch room and remote controlled from the motor position. For motors from 5 h.p. to 50 h.p. working at 440 V, special flameproof starter panels have recently been developed.

Wires and Cable Census

PRELIMINARY REPORT, No. 76, published in the *Board of Trade Journal* for Nov. 11, 1950, gives details of the electric wires and cables trade for the year 1948. It is estimated that the data given covers 99% of the Industry.

The value of production in 1948 was £99,083,000 compared with £54,346,000 in 1946 and £32,303,000 in 1937. A considerable increase in the cost of materials, fuel and electricity used was, however, registered, comparable figures being £59,383,000, £30,335,000 and £20,029,000. Thus while the value of production rose 82% between 1946 and 1948, the overall cost of production (excluding wages) rose 95·5%.

Wages and salaries of the people directly employed rose from £12,812,000 in 1946 to £19,362,000 in 1948, although a compensating factor was that the value of the net output per person employed rose in the same period from £486 to £620.

Stocks of finished products, etc., and materials and fuel showed a remarkable increase as indicated by the table.

Of the 49,227 operatives employed in the industry in 1948, 34,076 were male of whom 1,367 were under the age of eighteen; and 17,324 were female of whom 806 were under eighteen. Administrative, technical and clerical staff totalled 14,341 in 1948. It is interesting to note that from 1937 the percentage increase in operatives was 51·5%, while for technical, clerical and administrative staff the percentage increase was over double, being 113%.

Stocks of Finished Products, etc., Materials and Fuel

	Beginning of Year				End of Year			
	1948	1946	1937	1935	1948	1946	1937	1935
	£'000	£'000	£'000	£'000	£'000	£'000	£'000	£'000
Finished products and work in progress	13,099	6,257	1,747 (a)	1,057 (a)	16,754	7,434	1,908 (a)	1,303 (a)
Materials and fuel ...	11,131	6,144	—	—	12,344	6,884	—	—

(a) Work in progress only.

E.P.E.A. ANNUAL DINNER

TO the South-Eastern Division of the Electrical Power Engineers' Association, as successors in title to the former Southern Division, falls the honour of organising the Annual Dinner for the members of the National Executive Council. This year's dinner, held last week, has continued the established tradition.

The principal guest, the **Rt. Hon. Philip Noel Baker,** Minister of Fuel and Power, proposed the toast of "The Association." The Minister referred to the rapid growth in electrical consumption, and the reason for the need for power cuts. The electrical industry was not the only one subject to peak demand, it applied to transport, and even politicians have their peak loads. Before the war, plant was replaced at the end of twenty years but now one quarter of our plant is over twenty-five years old. This year 950 MW of new capacity will be installed, and the Government is resolved that this effort shall go on. The fact that in the U.S. every worker uses six units per man hour compared with two in this country is a measure of the progress still to be made. He was convinced, however, that the problem of peak load will not be solved without means of power storage, and they were examining the possibility of water storage.

Replying, the E.P.E.A. President, **Mr. W. Ingledew,** pointed out that members of the Association had risen to responsible positions in the industry, which needs the best services of its members. The Association had played a great part in setting up the Joint Advisory machinery and it can contribute a great deal to it.

The toast of the "Electricity Supply Industry" was proposed by **Sir Archibald Gill,** President of the I.E.E. Referring to his association with the G.P.O., he said they were large customers of the supply industry, and they also suffered from the same restrictions on capital development. He commented on the forthcoming I.E.E. conference on Electricity as an aid to Production.

An attack on ill-informed criticism was made by **Lord Citrine** in his reply to the toast. He said he was proud to respond as the industry is under fire from some who ought to be better informed. He said the Press have been generally fair, the technical press pre-eminently so, but this did not apply to all papers. Unfortunately some people don't like nationalisation. There were recent examples of papers deliberately suppressing letters and statements sent in by the B.E.A. to correct ill-informed criticism. The industry is going through a period of phenomenal expansion in load and plant, and it has been impossible for manufacturing capacity to overcome our wartime deficit. He thanked members of the Association for their restraint during the first few months after vesting. It showed statesmanship on the part of their leaders. He paid a particular tribute to the operating staff of the industry who had greatly raised our standard of efficiency.

Finally, the Chairman, **Mr. L. V. Mountfort,** Chairman of the South-Eastern Division, proposed a toast to **Mr. Smethurst,** who for over twenty years has had the responsibility for the organisation of this function. Mr. Smethurst thanked the members.

Power speeds Public Works

Current Exhibition shows trend towards Electricity as prime mover

OLYMPIA, London, is the scene of the 1951 Public Works and Municipal Services Congress and Exhibition which, under the patronage of H.M. the King, is open until November 18.

It was interesting to note that more and more equipment is now available equipped for electric drive.

Outstanding exhibit from the point of view of the road engineer is undoubtedly the mobile electric asphalt plant, shown by Stothert and Pitt Ltd., of Bath. This plant has a capacity of 15 tons per hour, has separate motors with enclosed driving gears for all motions and is arranged to take power connections either from portable diesel generators or from the public supply. Its mobility is a point worth considering.

Road signs and street lighting come within this province and there are many examples of modern efficient equipment. "Keep Left" bollards for road islands are shown by I.R.S. Ltd., Gowshalls and Bergo Ltd. These firms specialise in road signs. An important exhibit is the "Signlite" a new fitting for illuminating any sign. It illuminates the whole of the road sign, even in a range of signs and conforms to Ministry Regulations.

Stanton Ironworks Ltd. feature on their stand, scale models of eight Stanton spun concrete lighting column designs which have received the approval of the Royal Fine Art Commission amongst other iron and concrete products.

This is the Victor electric hammer drill

Street lighting, of course, can only be efficient when the control of it is efficient, that is why the exhibit of the Automatic Telephone and Electric Co. is important. They feature a display of "Rythmatic" ripple control equipment amongst their other equipment. Their display also includes "Electro-Matic" traffic signals, which are now widely used throughout this country. Portable traffic signals of various patterns most essential where major road works are in progress are featured by George Pike Ltd. These are designed to operate from portable generating sets which the firm also produce and exhibit at the show.

The Horstmann Gear Co. make "H.B.E." time switches which are an asset to any lighting installation. Particularly interesting is the electrically wound time switch with reserve spring. The latest H.B.E. model is shown.

Unusual but clearly most sensible is the battery electric sweeper shown by Lewin Road Sweepers Ltd. This is similar in operation to the petrol-driven model but is powered by a 24 V d.c. electric motor.

Sewage and water purification are two important matters which come within the scope of this congress and exhibition and here again much of the machinery is electrically powered. Important are the displays by Henry Sykes, Hughes and Lancaster, James Beresford and Sons, Wallace and Tiernan, Bell Brothers and the Lea Recorder Co. These include pumping systems and control schemes.

Electrical power seems to be used more extensively now in the range of contractors' plant and tools which are on show. Notable are the air compressors by Holman Brothers, the concrete vibrators shown by E. P. Allam and Liner Concrete, the mixers by Colcrete, the tools shown by Rawlplug, Victor Products and E. R. Cole. Victor Products feature especially their new electric hammer drill which has just been released. In addition to its hammer action it drills in hard materials without the need for manual rotation A.C.E. Machinery are featuring an interesting electric capstan.

However, power is not always available on site from mains supply so the wealth of petrol and diesel electric generating plant displayed assumes a reasonable measure of importance. Exhibitors are A.B.O.E., R. A. Lister, Sentinel and Arthur Lyons amongst others. These firms have long been renowned for the reliability of their plant.

Other equipment of interest is the Barryweld Incinerator shown by Saniguard Appliances, the grass and hedge trimmers for parks shown by Tarpen Engineering, the water heaters by Campbell Engineering, cleaners and polishers by R. G. Dixon and Electrolux, and the electric trucks by Tomlinson's Electric Vehicles.

The BUYER'S *Column*

Seeing That All Is Well

THE direct reading "Auto-Photometer" produced by EVERETT EDGECUMBE AND CO., LTD., Colindale Works, London, N.W.9, is an instrument essential to any lighting engineer or contractor. It gives clearly and quickly an exact measurement of all types of illumination from 0·1 ft. candles upwards.

Everett Edgcumbe's photometer

The instrument is in two main units, the autophotic, barrier layer selenium cell, in a rigid frame which can be sealed for use in tropical conditions, coupled by 4 ft. T.R.S. flexible cable with moulded plug to the direct-reading meter.

The meter can be supplied calibrated in ft. candles or in Lux (1 ft. candle = 10·76 Lux). It is especially clear to read, the 3¼ in. round indicator having a finely divided scale and a knife edge pointer. Special filters are available for use in intensities above 500 ft. candles, thus extending the use of the unit to any desired range.

Supplied complete in a leatherette-covered case, the "Auto-Photometer" is priced £13 12s. for the single range 0-300 ft. candles to £31 4s. for the triple range type.

The "Electrojan" Relies on Exide

RECENT arrival in the fleets of electric vehicles now seen everywhere in Britain is the "Electrojan," electric counterpart of the well-known "Trojan" light delivery van. Outwardly they are almost identical, understandably so because they are assembled on the same production lines, and a large number of components are interchangeable. This striking advance in vehicle design and production enables operators to standardise a mixed fleet of electric and i.c. engined vehicles producing a uniformity of appearance, maintenance and spares.

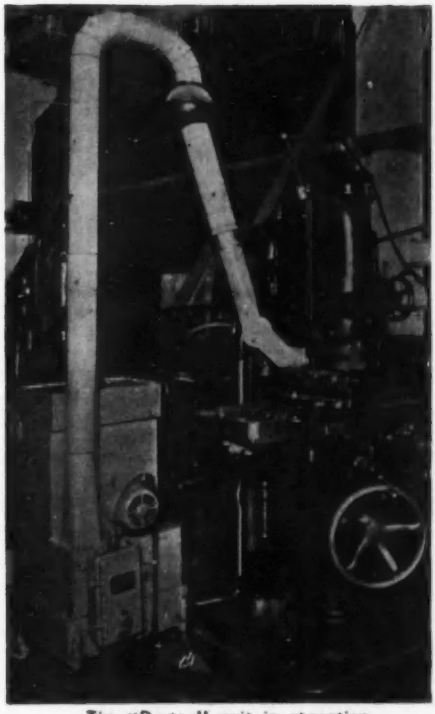
Driving controls are similar so that drivers need no special instruction in order to take over either type of vehicle. However, the operator will appreciate the advantages of a battery electric vehicle with its low running costs, absence of fuel problems, and off-peak charging. Even more they will appreciate the reliability of the "Electrojan," because power for its 8-h.p. series-wound 18 m.p.h. under-bonnet motor comes from a 60 V 175 A/h "Exide" Ironclad battery by CHLORIDE BATTERIES LTD., Clifton Junction, Manchester. The range, depending on operating conditions, is about 25 miles per charge, but given a favourable route the "Exide" battery, which is of the latest type, would give a much higher mileage.

Collecting Cast Iron Dust

THE light dust resulting from machining operations on cast-iron components causes a formidable dust and dirt nuisance in the machine shed, for it penetrates into the intricacies of the machinery and motors, resulting in undue wear.

Overhead costs soar, and the operators become disgruntled and less efficient at their work.

These conditions can be averted, as many firms have discovered, by installing "Drytex" and "Drymat" dust collectors. These are made by DALLOW LAMBERT AND CO., LTD., Spalding Street, Leicester. They are fitted so that the cleansed air is re-circulated. Each model is a compact self-contained fully motorised dust extraction plant, the dust being deposited in easily removable containers. The "Drytex" unit is for lighter duties than the "Drymat."



The "Drytex" unit in operation

A Clip Which Works

WE recently received a sample of a hose clip which employs a new idea in construction. This "Raplok" hose clip made by EQUIPMENTS LTD., 35 Green Lane, Northwood, Middlesex, employs a flexible strap which passes through a special elbow screw clamp where by turning the screw it is pressed against the lip of the clamp. We found it simple to operate and found that due to the use of a flexible strap there was perfect circumference contact even on irregular surfaces. Additional advantages are that it is of one-piece construction and that one size fits any hose from ⅜ in. to 3½ in. dia. Price is 10d. each.

Erratum

IN our last issue we referred to the prices of the Venetian Lights made by T. B. MORLEY and CO., LTD., Jameson Street, Hull, as being inclusive of purchase tax. This is not so; the tax is extra.

Close Shaves For Motorists

THE all-British Automobile-Home Shaver is here. Known as the "Auto-home," this electrical dry shaver can be used in either car, home or office.

Produced by REMINGTON-RAND LTD., of Commonwealth House, New Oxford Street, W.C.1, this multiple-head dry shaver incorporates all the latest facilities of the standard Remington shavers and enables the user to remove the toughest beard within three minutes without moving from his car.

Designed for use on either 6 or 12 volt car batteries and on home supplies from 110 volts or 210/250 volts a.c./d.c., the "Auto-home" shaver has a special attachment which will readily fit to either glove compartment or dashboard of any make of car. It also has special leads, one for use at home or in the car, so designed that it is impossible for the user to plug into the wrong connection. It is supplied in an attractive and serviceable leather pouch. Ideal for business men, touring, or on camping holidays at home or abroad, the "Auto-home" shaver is a boon to the men behind the wheels in these busy days. Retail price is £7 16s. list plus £2 1s. 6d. purchase tax, making £9 17s. 6d. total.

TRADE PUBLICATIONS

CATERING EQUIPMENT.—Creda's recent HC2899 restaurant range features in a leaflet issued by Simplex Electric Co. Ltd., of Oldbury, Birmingham.

RESIN BONDING TECHNIQUES. A leaflet describing the many applications of resin in bonding is available from Aero Research Ltd., Duxford, Cambridge.

T.V. SUPPRESSION. An amusing leaflet has been issued by Edison Swan Ltd., 155 Charing Cross Road, London W.C.2, supporting the use of television suppressors in cars.

PUMPLESS RECTIFIERS. The G.E.C. pumpless air-cooled steel tank rectifier is described in great detail in a new bulletin issued by the General Electric Company Ltd., Magnet House, Kingsway, W.C.2. The reference No. is P.1187 (October, 1950).

ANGLE STRIP. Dexion Ltd., 189 Regent Street, London W.1, issue periodically *Dexion News*, a magazine which surveys contemporary applications of this material.

ELECTRIC WATER HEATING. Hot water on tap is a simple matter when Heatrae automatic water heaters are installed. A new folder issued by Heatrae Ltd., Norwich, describes their range of units.

REYROLLE'S CATALOGUE. Further sections are now available which replace pamphlets in the complete catalogues issued by A. Reyrolle and Co. Ltd., Hebburn, Co. Durham. They deal with small oil-volume circuit breakers, the protection of power systems, Class C horizontal drawout switchgear, telephase carrier current protection and attracted armature a.c. relays.

ALUMINIUM NICKEL ALLOYS. Another addition to the many technical publications issued by the Mond Nickel Co. Ltd., Sunderland House, Curzon Street, London W.1, is an interesting publication on aluminium alloy castings.

ACCESSORIES. From Nettle Accessories Ltd., Harper Road, Wythenshawe, Manchester, we have received a copy of their latest price list, together with the new quantity buying schedule.

LIGHTING FITTINGS. We have just received the new catalogue of attractive domestic and commercial lighting fittings which Philament Electric Ltd. make at their new factory at Bridgend Trading Estate, Glamorgan.

BOILER CONTROL SYSTEMS. Controlled heat means efficiency. It may be obtained from any boiler plant provided it is operated through a properly designed thermostatic control system. Such a system is that designed by the Fuel Efficiency Co. Ltd., of 20 Upper Ground, London S.E.1. A new leaflet describes the system.

WIRING ACCESSORIES. The "Wylex Armchair" monthly news letter, of Geo. H. Scholes and Co. Ltd., Wylex Works, Wythenshawe, Manchester, features notes on the Wylex 30 amp D.P. switch and block connectors.

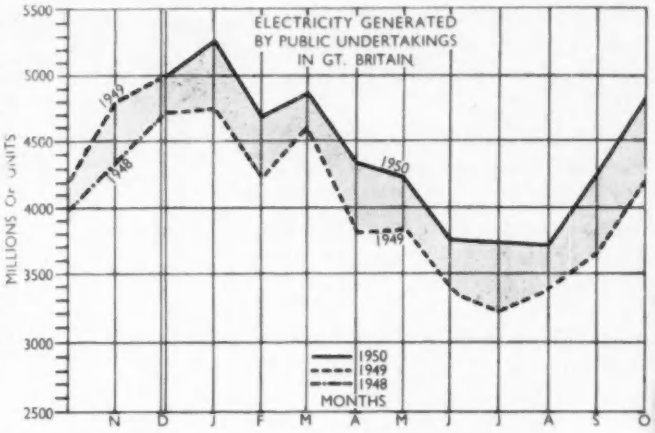
TRANSFORMERS AND SWITCHGEAR. A number of sections for insertion in the catalogue of Foster Transformers and Switchgear Ltd., South Wimbledon, London S.W.19, have now been received from the company. They include sections on mining-type transformers, h.v.c. cartridge fuses, H.I. switches and spare parts, VR/CF transformers and voltage regulating equipments.

UNITS GENERATED

4,830 million units was the total energy generated during October, 1950, in stations under the control of the B.E.A., the North of Scotland H.E. Board, and the Lochaber Power Co. The corresponding figure last year was 4,204, so there has been an increase of 14·9%.

Of the total, 4,639 million units were generated in steam stations and 170 million in hydro-electric.

Energy sent out during the month was 4,565 million units, 94·5% of that generated. This gives the total for 1950 so far as 41,285 million units, an increase of 11·5% on the corresponding period of 1949.



POWER SUPPLY IN OCTOBER

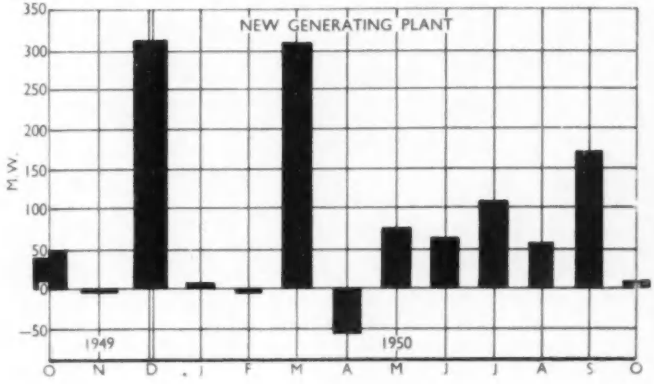
PRIDE of place in October's power supply statistics goes to Scotland, where the loading of the Loch Sloy turbines has brought the North of Scotland water-power generation figures to above the 100 million units/month figure for the first time—actually, 110 million was the total achieved. With the B.E.A. producing 60 million units by the same means, this brings the total energy from water power during the month to 170 kW hours, and the sum for the first ten months of the year to 1,191 million units, 31·9% above last year's total for the same period.

Thermal stations show a more moderate proportional increase, with the ten months adding up to 43,370 million units, 10·9% up on the 38,202 of 1949.

In installed generating plant it is again the north of Scotland that attracts attention with a 9 MW installed capacity increase in a month that has been completely blank for the B.E.A. from this point of view. With the total thus brought up to 442 MW, the north of Scotland has thus achieved during the last twelve months an expansion of 117 MW, or over one-third of their October, 1949 figure of 325 MW.

Boilers

B.E.A. generating capacity has been increased by the installation of boilers in three stations. First comes a 180 klb/hr John Thompson boiler at West Ham B, making the fourth commissioned there in the past 12 months. At Nottingham, a 320 klb/hr International Combustion unit has gone on load, while the third commissioning was at Neepsend (Yorkshire Division) where the first of three 190 k lb/hr Mitchell boilers has come on load.



GENERATING PLANT

At the end of October, 1950, the installed generating capacity of the B.E.A. was 14,213 MW, the same as at the end of September. The North of Scotland total was 442 MW, showing an increase of 9 MW during October. The figure for overall increase during the last 12 months becomes 1,046 MW or 7·7%.

The installed capacity used for the purpose of this graph should be distinguished from the output capacity. The installed capacity is the total m.c.r. of all the generating sets which are connected on both steam and electric sides and are suitable for service.

THE WEEK

INDUSTRY *in news* COMMERCE

Equipment in Quarries and Mines

REGULATIONS governing the use of electrical apparatus and cables installed in quarries and on the surface of metalliferous mines before July, 1938, are the subject of a Safety Circular published recently by the Ministry of Fuel and Power. The Minister has decided that the two exemption orders, made because of supply difficulties during the war which prevented the purchase of new cables and apparatus of the required standards, are no longer necessary and has accordingly revoked both orders. The draft regulations which the Minister proposes to make are briefly that cables and apparatus installed in quarries and mines must comply with the constructional requirements of the Quarries and Metalliferous Mines General Regulations, 1938. Only equipment in use before July, 1938 is covered by the circular (No. 184) which is available at the Ministry. Those who are affected and who wish to raise any objections to the drafts, must do so in writing before December 10. The regulations come into force on January 1, 1951.

Power Plant towed 3,845 Miles

THE floating power plant, aptly named "Seapower," which is one of four 3,000 kW mobile units built by the Bethlehem Steel Corporation during the war, has been in the news again recently. The plant was used at Antwerp in the months immediately following the war, and in 1946 was taken to Puerto Rico, where the Water Reserve Authority used it to carry peak power while hydro-electric plants were being completed. "Seapower" has now been towed the 3,845 miles from San Juan to Rio de Janeiro by the ocean-going diesel electric tug *Kevin Moran*, which belongs to the Moran Towing and Maintenance Co. of New York. The floating plant's new owners are the Canadian Traction Co., who are operating in Brazil under Government contract.

Wind-Power Co-ordination

THE necessity for saving fuel—particularly oil and coal—has led to formation, under the auspices of the Organisation for European Economic Co-operation, of an international group to investigate the technical and economic aspects of the utilisation of wind power for electricity generation.

The second meeting of the Group, held last week, had for its objects the standardisation of nomenclature and definitions, and the rationalisation of research between the member countries. Considerable progress was made in those objectives.

Speaking at a press conference last Thursday, Dr. D. Dresden, of Holland, who acted as chairman of the Group, explained that the subject of windpower was difficult and complex. The angle of attack had been somewhat different in various countries, and it was to enable the available data to be correlated and to avoid duplication of work that the meeting had been called.

Mr. Golding, of the E.R.A., heading the British representatives, gave some details of the present state of affairs in this country, and M. Cresson made a few remarks on behalf of the French delegation, pointing out that they had in France about 100 stations where measurements were being taken. Mr. Golding said that in this country some fifty sites were under measurement, all of them in well established windy districts. Two pilot wind generators were on contract, each rated at about 100 kW. One was being made by John Brown's of Glasgow, and would be erected in the Orkneys early next year, and the other, being made by Enfield Cables, was to be erected in Wales.

Diesel-electric for Steel Works

A DIESEL-ELECTRIC locomotive now in operation at the Corby plant of Stewarts and Lloyds Ltd., is claimed to be the first of its type used for regular steel works service in Britain. Its design was developed by the parent company, Crompton Parkinson Ltd., after a long series of

The First Half-Century

From Professor Perry's I.E.E. Presidential Address. "A strong imagination well under control surely is the greatest of mental gifts. I look around me and wonder how many of us really have it; and how many of us are only dull music-hall loving men, whose aim is merely to make money through electricity, who love it not for its own self, who cherish their twopenny-halfpenny-worth of theory because it is sufficient for their immediate wants. Why, even the writers of leading articles in the daily press can talk of the wonders of electricity and what may yet come to pass. Yet we who make the machines are like Calibans oblivious of the wonders of the fairy isle—like Aladdins who rub our lamps only to get the necessaries of life."—(*From our issue of 15th November, 1900.*)

tests on an experimental loco built in 1946, and it has undergone severe tests in industrial plants with large sidings and in railway shunting. The 45-ton locomotive has a maximum speed of 40 m.p.h. with a pulling power of 30,000 lb. and is driven by a Paxman engine developing 430 h.p. at 1,250 r.p.m. which drives through a Crompton traction generator. The generating set with a 24 V auxiliary generator and motor-driven priming pump form a single removable unit. The firm already has a fleet of over 60 engines at the Corby plant.

A second item of interest comes this week from another associated company of Crompton Parkinsor, the Young Accumulator Co., which has introduced new packings to protect motor-car batteries during transport and storage. For the export market, each battery will be contained in a thick shock-absorbing material moulded in two halves and enclosed in a strong cardboard carton. This, it is hoped, will give complete protection during transit and handling.

Electricity Statistics

MUCH of the information on electrical supply that used to be published annually by the Electrical Commissioners is included in a new Stationery Office publication, "Ministry of Fuel and Power Digest, 1948 and 1949," which is priced at 7s. 6d. The 29 tables in the electrical section of this Digest cover much the same ground as the appendices of the B.E.A. first report, but the breakdown of overall totals is different, and the basic period is the calendar year. In spite of the title of the publication, which covers the whole range of M. of F. and P. interests, the electrical tables mainly refer to 1948, with no mention of 1949.

Accident Prevention

EMPLOYEES at the Prescot, Melling and Willenhall factories of British Insulated Callender's Cables Ltd. played a big part recently in a number of competitions and social functions aimed at minimising the accident rate in the works. Many took part in a poster design contest and drama competition, and other social events during the Accident Prevention Week included a whist drive and dance, and gala evening concert in which employee artistes took part with Peter Cavanagh as guest star.

An important event at Prescot was the day set aside for visitors, when some 1,700 people took the opportunity to see the workshops and carry out a tour of inspection. It is too early yet to predict the success of the campaign, but an encouraging sign was that during the week the average accident rate dropped considerably in all three factories.

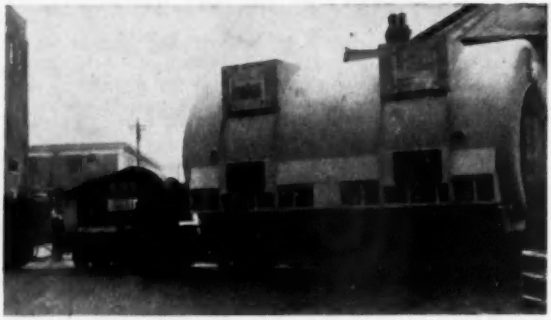
Vertical Fluorescents in Chester

NEW vertical pattern fluorescent lanterns, each containing four 5 ft 80-watt lamps, have been used in the installations inaugurated recently in St. Werbergh Street, Chester This type of lantern has been designed specially by the G.E.C. to harmonise with historic buildings during the daytime and show them off to best advantage after dark, although their primary purpose is, of course, to light the road surface. It is one of the first instances of the installation of these lamps in England, a similar street lighting scheme having been opened in South Shields some two days previously. In the past it has been customary to floodlight the cathedral and the ancient King's College during Chester's annual Arts Week, but the town's lighting authorities have found that this is no longer necessary. The G.E.C. seem to have solved the problem of street lighting which accentuates rather than hides the architectural beauty of our ancient boroughs.

Nail in Wiring—Who Pays?

IF a nail is discovered penetrating the electric wiring of a council house, causing the meter to register excessively, who should be held responsible for footing the bill for the extra charge? That was the problem confronting the Liskeard Rural District Council recently when the matter was raised by a member on behalf of a tenant at the Council's Hills View estate. It was stated that the tenant noticed the meter was running fast and reported the matter to Council officials, but nothing was done for ten days. The surveyor explained that the matter was immediately reported to the South-Western Electricity Board which made an inspection, and, finding nothing wrong with the meter, suggested that the wiring was at fault. After further complaints were made, they found a nail had been driven through a board into the wiring. The question was, "who drove in

St. Werbergh Street, Chester, showing the effect of the new lighting installation on the Tudor buildings



A turbo-alternator being delivered at Fulham power station by Robt. Wynn and Sons, Ltd., Cardiff. The outer frame weighs 80 tons, is over 25 ft long and 15½ ft wide, and the vehicle which carried it is the only one in the country capable of transporting so big a load. The inner stator weighs 108 tons, and the delivery is claimed to be the first occasion when a pneumatic-tyred vehicle carried a load of over 100 tons

the nail—the contractor, the Electricity Board workmen, or the tenant"? It was also pointed out that the tenant was also running a wireless set and consuming more current. After the clerk had emphasised that if there had been any delay by the Electricity Board it was not the responsibility of the Council, it was considered politic to move the next business.

Commons Lighting at the I.E.S.

LIGHTING in the new House of Commons (see ELECTRICAL TIMES, Feb. 2, 1950, p. 157, and Oct. 26, 1950, p. 660) was described to the Illuminating Engineering Society at their monthly meeting on Tuesday by Mr. C. Dykes Brown. Describing the many difficulties which had to be overcome, the author mentioned amongst other items, the necessity of providing a glass for the ceiling laylight which, in daytime, would resemble the oak roof while having a high transmission factor with good diffusion and, at the same time, be unbreakable. It was necessary to examine no fewer than eleven different types of glass before a specially-tinted 3-ply glass was finally decided upon as best fulfilling the requirements.

Sugar, but Not Enough Electricity

THE world market for sugar reflects the internal prosperity of Cuba, and with most countries not being prepared to expend more dollars on this commodity at the present time, the earlier periods of expansion have not been continued. And now, with the tendency of the sugar crop to decrease in size, the period of active investment in diesel power plants has come to an end, according to the overseas economic survey of the country, just issued by the Board of Trade. Cuban imports of electrical goods and apparatus in 1948 amounted to $2,163,000 of which only $245,000 were derived from the U.K., and about 90% of this amount was for lead-sheathed cable alone. The market for other electrical apparatus is almost exclusively American. An investigation of the hydro-electric potentialities of Oriente Province has been ordered, meanwhile most of the electricity is supplied by a company undertaking which has paid no dividends since 1933. This company, however, proposes to spend a further $30 million on development in the next five years.

Advertising Electricity

AMONG matters under discussion by the London Electricity Board Consultative Council is the question of how and to what extent the electricity supply industry should be advertised. General opinion was that advertising should not cease altogether, but the difficulty was how to advertise without increasing the maximum demand, said Chairman Mr. I. J. Hayward, at the Council's meeting last week. The public, he said, was entitled to know what was being done to meet the shortage, and that was the object of the power station advertisements. What people wanted to know was why there should still be a shortage while all this new building was in progress.

Clr. R. C. Kiloh suggested that a film should be made showing the work that had been done, an

The framework and roof of the Turbine House at Skelton Grange power station, which is nearing completion, consists of concrete frames supporting a shell concrete roof with a span of 79 ft. This is the first time a shell roof has been used in the construction of a turbine house, which at Skelton Grange is 750 ft long and 88 ft high

Window display of Weston-Hart, 84 London Road, Portsmouth, which won first prize (£100) in the Ekco window display competition. C. A. V. Nicholls, of Southern College of Art, was awarded the first student's prize (£20) for his co-operation in this display

opinion also held by Clr. W. H. Shaw, who said that although power stations were not catching up on arrears, some indication must be given that headway was being made. Mr. Hayward interrupted to say that was impossible because there was no headway—the growing demand was keeping pace with development. New appliances were coming on the market, and the question arose as to whether the public should be kept in ignorance or whether the appliances should be boosted, thereby increasing the demand for electricity. Showrooms were educating people in the use of electrical appliances; if we "pipe down" we lose a great opportunity of telling people what is available when supply is better, but alternatively the question arises, why make the articles when there is insufficient current to go round?

Ald. G. C. Carter said that while the public did not object to being educated they might object to the Board's spending a lot of money. He added that if the Gas Board was pushing their goods, the electrical industry would suffer. Mr. Hayward remarked that if electricity was not available, the alternative was gas, and once gas was adopted it would be extremely difficult to persuade the public to switch over to electrical appliances. The discussion ended abruptly with the chairman's assurance that there would be further opportunities to go into the matter.

Ekco Display Competition

THE annual window display competition, organised by E. K. Cole Ltd., has been won by Weston-Hart of 84 London Road, Portsmouth, who thereby pockets the first prize of £100. An innovation in this year's contest was the arrangement by which dealers could solicit the help of local art school students in dressing their windows, and this proved so successful that all the first three prizes went to dealers who availed themselves of this opportunity. The winning student was awarded a prize of £20. The second prize of £50 in the competition was won by Methuen Simpson Ltd., Dundee, and the Gillingham (Kent) firm of Gentry and Bayley Ltd. gained third place and £20. Students who assisted the second and third prizewinners won £10 and £5 respectively.

Load-shedding in Wales

A NEW load-shedding rota has been published by the South Wales Electricity Board, which asks all consumers to co-operate in reducing the burden of power cuts to a minimum. Industrial consumers in the area have already arranged to make substantial contributions towards minimising the necessity of cuts by spreading their peak loads throughout the winter. This rota follows a similar scheme by the Yorkshire Board, referred to in our issue of September 21. Announcing their action the South Wales Board points out that some time will elapse before the construction programme in the industry will catch up with demand which increases by 10% each year. The rota applies to all consumers, and the area has been divided into five groups with each division having a day of hazard on which cuts may be expected. In any case both domestic and commercial consumers are asked particularly to use electricity sparingly during peak periods.

The ground floor showroom of the new service centre opened at Bootle by the Merseyside and N. Wales Electricity Board. In addition to up-to-date facilities for the display of electrical apparatus, the centre includes a demonstration theatre with fully equipped kitchen and projection box for showing instructional films.

At the Hoover banquet on the first night of their three-day sales conference, showing (left to right) Mr. F. H. Bunn, Mrs. C. E. Whiteley (Mayoress), Sir Charles Colston, Mrs. Bunn and Mr. W. Pickey

Hoover Sales Conference

A SPECIAL train, "The Hoover Ltd.," took the main party of delegates from London to Harrogate for Hoover's three-day conference of sales managers. The Londoners were accompanied by representatives from the Continent and altogether 350 persons, including the wives of many delegates, were accommodated at the Majestic Hotel, where the conference was held. Sir Charles Colston, chairman, told his sales managers of the progress which had been made. Sales of cleaners last year, he said, more than doubled those in the company's record pre-war year, while sales of washing machines also exceeded the retail turnover in the record year before 1939. The salesmen must have been pleasantly satisfied with their work during 1949, which had made it necessary to approach the Board of Trade to build further extensions to the Merthyr Tydfil factory.

Sir Charles also mentioned Hoover's policy of giving priority to export orders which had resulted in 43% of products going to hard currency countries. The Mayor of Harrogate was guest of honour at a banquet held on the first evening.

London-Denmark Telex Traffic

TELEX traffic between Great Britain and Scandinavia will be greatly facilitated by the recent commissioning of the Anglo-Danish submarine cable, the laying of which was recorded in the ELECTRICAL TIMES for July 20, 1950, p. 105. Manufactured by Submarine Cables Ltd., a joint subsidiary of Siemens Bros. Ltd., and Telegraph Construction and Maintenance Co. Ltd., it is the longest co-axial cable yet laid, and the equipment, manufactured by Siemens, has now been installed in London, Copenhagen and Esbjerg. Nine voice-frequency traffic circuits have been put into service.

The British telegraph terminal is located in the Great Northern Telegraph Company's offices in London, and the Danish terminal in the Post Office main station in Copenhagen. Between London and the cable station at Weybourne, and between Esbjerg and Copenhagen, the circuits are carried through the inland network of the respective telephone and telegraph administrations.

Noise measurements made on the completed installation have shown that the precautions taken in cable construction, choice of landing point and installation arrangements have secured a very effective reduction of external interference, and it is anticipated that up to 24 circuits can be worked over the present system. At a later date the number of circuits will be further increased by the addition of submerged repeater equipment in the cable.

E.I.B.A. Ball

"AS good as the pre-war functions," was the unanimous verdict of those who attended this year's annual ball of the E.I.B.A., held at its usual venue, Grosvenor House, on Friday last. The large attendance, numbering about 1,000, resulted in the Association's fund benefiting to the extent of £1,200—double last year's figure. Thirty-eight valuable gifts were provided, including a television set, and the gathering spent a thoroughly enjoyable evening dancing to music by Sidney Lipton and his orchestra, which was interspersed with a cabaret. A penny collection brought in £141 while the sale of programmes realised £364, both considerably higher than last year's totals. Incidentally, the smart programmes were provided by B.T.H.

NEWS IN BRIEF

The annual meeting of the Electrical Trades' Commercial Travellers' Association will be held at 5.30 p.m. tomorrow (Friday) at the Feathers Hotel, Broadway, S.W.1. The Association has also announced that its annual dinner will be held at the Windsor Castle Hotel, S.W.1, on December 7.

The Federation of British Industries has published a booklet on proposals for the amendment of the Town and Country Planning Act (1947), which points out that the Act is proving a serious deterrent to development. Conclusions reached on how the Act and administration should be adjusted have been listed and forwarded to the Minister of Town and Country Planning and Secretary of State for Scotland.

An instance of B.I.C.C's policy of effecting a closer relationship between management and staff was the dinner held in Glasgow recently, when 230 northern representatives of the staff were the guests of their employers.

The Old Nions' Association (past students of Northampton Engineering College, Clerkenwell) will be holding their 23rd annual dinner and reunion at the Connaught Rooms on December 8.

Questions in Parliament

A.M. or F.M.?

Replying to a question by Mr. W. Shepherd, the Postmaster-General, Mr. Ness Edwards, said the B.B.C., as part of its general research, was investigating the relative merits of both frequency and amplitude modulated broadcasting on very high frequencies by experimental transmissions from the Wrotham station. The cost was about £20,000 a year. He could not say whether a.m. or f.m. would be used until the experiments had been concluded.

Copper

Mr. Grimston asked the Minister of Supply if he was aware of the sudden demand for copper from unusual export markets, and what steps he was taking to keep the metal in this country for the use of our finishing industries? To the first part of the question Mr. Strauss answered "yes." The export of copper and copper scrap, except under licence, was prohibited. Licences were granted exceptionally for the export of very small quantities of unwrought copper. Exports, under licence, of copper alloys in ingot form were restricted to a quota based on 1949 exports. Since September 11, 1950, exports of semi-manufactures of copper, except under licence, have also been prohibited. Licences were also granted for export to traditional markets, notably Commonwealth countries. These exports were now being reviewed.

Industrial Participation

Replying to a question by Mr. Erroll, the Minister of Supply, Mr. G. R. Strauss emphasised that although the time was not yet ripe for large-scale participation by industry in the development of atomic energy, industrial firms were helping in preliminary studies of the feasibility and design of power reactors. Every encouragement and assistance was being given to the development of industrial applications of radio-active isotopes.

Load Shedding

Answering a question by Sir Herbert Williams, Mr. Noel-Baker said 12·2% of the B.E.A.'s generating plant was out of action on October 31 for overhaul. On the matter of load shedding, raised by Col. Ropner, he explained that the Authority was now supplying 27% more electricity than at vesting day. To mitigate inconvenience arrangements had been made for the load spreading proposed by the Electricity Sub-Committee of the National Joint Advisory Council. Lighting of shop windows and advertisements was restricted over the peak hours, and domestic consumers had been urged not to use more current than they must during those periods. Subsequently, he stated that the Board endeavoured to let consumers know beforehand when power cuts were likely, but when it was definitely known that a cut must be made there was not time to warn all consumers but as many large consumers as possible were notified. He understood that it was technically impossible to give a warning by reducing the voltage or by causing lights to flicker, before a cut was made. The matter of load-shedding was subsequently raised by Mr. Osborne, who asked if, in view of the opposition of both sides of industry to working staggered hours, he would consult with industries in order to arrange work on Saturday mornings to reduce the abnormal load during peak hours?

Power Station Building Work

During the course of the debate on housing in the Commons last week, Mr. Marples made the point that some of the building work for power stations under the capital investment programme could be cut without retarding development—it was not necessary to build "cathedrals" to house power stations. In America power stations were built and left in the open without anything round them, but in this country some of the superstructure was far too extravagant and expensive, he said.

Power Plant

When the question of new power stations was again raised, Mr. Noel-Baker, Minister of Fuel and Power, said that since vesting day the B.E.A. had begun constructional work on 16 new power stations and extensions to 7 existing stations, the generating capacity involved amounting to 2,746 MW. The list is given below. The Authority had also begun preliminary work on 12 other new stations and on 35 other extensions, the total capacity being 4,346 MW. This plant will become available between 1953 and 1956.

New Stations	*MW*		*MW*
Acton Lane ...	56	Fleetwood ...	84
Bold	56	Goldington... ...	112
Carrington ...	224	Littlebrook "C" ...	225
Chadderton ...	112	Meaford "B" ...	168
Connah's Quay ...	112	Plymouth "B" ...	90
Doncaster ...	112	Roosecote	112
Drakelon	224	Tilbury	280
East Yelland ...	84	Uskworth	336
Extensions			
Clarence Dock ...	98	Portsmouth ...	28
Huddersfield ...	55	Warrington ...	28
Northampton ...	56	Woolwich	57
Peterborough ...	37		

Power Station Posters

When Major Beamish asked which new power stations conceived and constructed since the B.E.A. came into being had been completed, Mr. Noel-Baker explained that it took four years to plan and build a new station and install the plant. As vesting day for the B.E.A. was April 1, 1948, none of the stations which they had planned was yet operating. When asked why the B.E.A. spent money on an expensive poster-advertising campaign under the heading: "Another New Power Station," he answered that the purpose of the Authority in their advertisements was to show people that something was being done to increase capacity, and to urge on them the necessity not to use more electricity than they need at peak hours.

Electric Supply News

Cheshire

Following an application from the B.E.A. to develop an electricity generating station at Elton, Cheshire County Council Town and Country Planning Committee are asking the council to object. The Committee say that the proposal would injure the amenities of Helsby, Ince, and Elton, and that the site is in an area which has been reclaimed for agriculture at considerable cost. There are no satisfactory proposals for the disposal of the ash produced, add the Committee, and the provision of public services, particularly water, was likely to be difficult. The Committee think that most of the obstacles could be overcome by extending the B.E.A.'s existing station at Connah's Quay.

Durham

The County Council has been informed of a plan by the British Electricity Authority for the construction of a 275 kV overhead grid system from Stella, near Blaydon-on-Tyne running south through County Durham to West Melton near Sheffield. The new lines will be carried on towers 115 ft. high compared with 85 ft in the existing grid system.

East Midlands

The East Midlands Electricity Board is to proceed with a scheme, costing £43,000, to supply current to the villages of Hersington, Thimbleby, Minting, Bucknall, Stixwould and Southrey, in the Horncastle area, although it may be nearly two years before the constructional work can be completed.

Eastern Board

The Eastern Electricity Board has now considered the decision of the Consultative Council to make a representation to the B.E.A. on the proposed variations of tariffs (which we reported on November 2). In order to allow ample time for consultation between the Central Authority and the Consultative Council the Board has decided to postpone the introduction of the tariff variations until January 15, 1951.

Edinburgh

As another shot in the question of the disposal of reserves, which was discussed in the House of Commons recently, the South-East Scotland Electricity Board has now written to the Minister of Fuel and Power stating that they cannot conceal their feeling that in this matter their consumers have been exploited, and they cannot disregard the strong sense of public grievance over the treatment of South-East Scotland in this connection. They ask the Minister to say on what ground it is justifiable for the Central Authority to retain the former local authority general reserve funds in South-East Scotland and to transfer the benefit of these funds to areas such as the London area.

Eire

Work is in progress in Donegal on the erection of wind velocity recording instruments whose purpose it is to provide data for the Electricity Supply Board and the British Electrical Research Association as to whether it will be possible to use wind power as a source of electricity production.

Fort William

Employees of the North of Scotland Hydro-Electric Board at the Fort William diesel-engined power station narrowly escaped injury when the engine-house was wrecked by an explosion on Wednesday of last week. The fire which broke out was soon quelled, but the town was without electricity for about an hour. The British Aluminium Co. offered to assist the Board in every way possible with a supply from its local water-power station.

Huncoat

Consent of the Minister of Fuel and Power has been received by the B.E.A. for the completion of the Huncoat station, Accrington, to its full capacity by the installation of two 30 MW turbo-generators and one cooling tower. The station's ultimate capacity will be 120 MW.

Malvern

The U.D.C. last week adopted a recommendation that the Ministry of Fuel and the Midlands Electricity Board be informed that the Council was strongly opposed to the placing of overhead electric lines on any part of the Malvern Hills and that the line now contemplated ought to be laid underground.

Manchester

At next month's council meeting will be presented the full report of the Housing and Wythenshawe Committees on the position of the district heating scheme proposed for the Wythenshawe estate. It will recommend the abandonment of the scheme (a) because of the excessive cost (8s. 9d. weekly) to tenants of the houses on the estate, (b) failure on the part of the B.E.A. to buy at acceptable terms the residual power from the two thermal generating stations, (c) failure of the Ministry of Fuel and Power to give any financial backing, and (d) the uncertainty of the ultimate cost. The City Council will be asked to approve an application to the Minister of Health for consent to borrow £11,998 more for consultants' fees.

North of Scotland

The first of the 12,000 kW turbo-alternators in the Fannich hydro-electric generating station at Grudie Bridge, Ross-shire, was started up and brought to full load last Thursday after tests. The second generator in the station is almost ready after testing. Fannich is now drawing water from Loch Fannich, and is the first of the Conon basin group of schemes which will have six power stations with an estimated annual output of 437 million units.

LIGHTING SCHEMES

Ashby Woulds.—The U.D.C. is to approach the East Midlands Electricity Board with a view to having fluorescent street lighting installed throughout the whole district.

Gainsborough.—The U.D.C. is to investigate the possibility of converting nine streets at the centre of the town from gas lighting to electricity.

Hove.—The T.C. has approved additional decorative lighting in connection with the Festival of Britain, at a cost of £775.

Margate.—The T.C. has rejected the proposal to convert all street lighting to electricity.

Northallerton.—The U.D.C. is considering a street lighting improvement scheme, estimated to cost £2,200.

Padiham.—The U.D.C. is to improve street lighting in the town at a cost of £3,000.

Penrith.—Plans are being prepared for the electric lighting of the A.6 trunk road through the town.

Portland.—The U.D.C. has received M.o.H. consent to the borrowing of £1,480 for converting certain street lighting to electricity.

Swinton and Pendlebury.—T.C. submitting to M.o.T. plans for sodium lighting on trunk road A6 through the town.

Teignmouth.—The U.D.C. has agreed to spend £500 next year on additional lighting on the seafront and Ness headland.

Welshpool.—Borough surveyor to prepare specifications for the lighting of trunk roads between Bod-Owen and Traethbawn and The Cross and Raven Square.

Wigston.—U.D.C. sub-committee has recommended the provision of electric lighting on all new housing estates.

Company Activities

British Aluminium Co.

It is announced that permission of the Capital Issues Committee has been obtained for the issue of 2,000,000 Ordinary shares of £1 each at 34s., of which £1 is payable on application. The new shares will carry entitlement to half any final dividend declared for 1950. Provisional allotment letters and application forms are being posted today, November 16.

B. and F. Carter Ltd.

A trading profit of £45,540 (*£31,002*) was made for the year ended July 31 last by this firm which specialises in cable making machinery. Taxation absorbs £18,006 (*£11,847*), and dividend 12½% (*10%*), plus bonus 5% (*same*) takes £5,775, leaving £23,415 carried forward.

Heenan & Froude Ltd.

Announcing a final Ordinary dividend of 10% (*same*), payable on December 19, making 15%, the preliminary statement for the period September 1, 1949 to September 2, 1950, shows a group profit of £327,358, as against £242,546 for the previous year. After allowing £193,097 (*£140,444*) for taxation, the net profit is £134,261, compared with £102,102.

Oliver Pell Control

A group trading loss of £10,007 is reported for the year to March 31 last, compared with a loss of £14,650 in the preceding year. To the former figure is added interest on debentures and fixed loans of £3,486 (*same*), interest on bank overdraft £720 (*£830*), audit fee £371, directors' emoluments £1,686 (*£2,050*), depreciation of fixed assets £3,502 (*£3,624*), off patents, etc., £85 (*£92*), and provision for loss on investment in associated company £3,500 (*£12,500*), and after allowing for £797 interest receivable the group net loss amounts to £22,560 (*£36,709*). The parent company's net loss is £21,278 (*£33,095*), which increases the debit balance to £54,383.

J. and F. Stone Lighting and Radio

Group profit for the year to June 30 last was £339,306, as compared with £305,972 for the previous year. After charging £24,199 (*£21,463*) to depreciation and amortisation, £190,175 (*£175,985*) to taxation, plus other items, the balance is £149,131 (*£129,987*). With £54,116 brought in there is £203,247 (*£172,075*) available. To further provision for deferred repairs nil (*£17,509*), dividends absorb £91,784, and Preference redemption fund £8,666, leaving £102,797 carried forward. The chairman, Mr. D. G. Nunn, states that the Preference redemption fund is practically £100,000, and under the terms of issue could be redeemed. The company, however, would need to transfer from revenue reserves about £100,000 to enable this to be done. It is proposed to review the question from time to time in future, and when the directors consider it in the interests of the company to redeem the remaining preferences, it will be done.

Tube Investments

The preliminary statement shows that the group trading profit for the 53 weeks to August 5 increased to £6,024,839, compared with £4,840,467 for the previous 52 weeks. Taxation provision amounts to £3,583,223 (*£3,053,450*), leaving a net profit of £2,699,428 (*£2,064,382*). There is a final Ordinary dividend of 12½%, making 25% (*both same*), payable on December 13.

Dividends Declared

Carrier Engineering Co.—Dividend of 25% (*35%*) on increased capital.

Dictograph Telephones.—Final dividend of 10% making 20% (*both same*).

Enfield Cables Ltd.—Interim dividend of 3¾% (*same*).

Johnson & Phillips.—Interim of 7½% (*same*).

Sun Electrical Co. Ltd.—We erroneously referred to the 10% dividend last week as an "Interim." It is in fact the final and only dividend for the year.

Commercial Information

CONTRACTS OPEN

HOME

Nov. 17.—Belfast. Supply of domestic refrigerators to N. Ireland Tuberculosis Authority. William Harvey, secretary, 27 Adelaide St., Belfast.

Nov. 17.—Higham Ferrers (Northants) T.C. Installation of electric light in five houses on Windmill Banks estate. Borough Surveyor, Town Hall.

Nov. 17.—Sheffield T.C. Electrical installations at Greenhill county school. W. George Davies, City Architect, Town Hall, Sheffield 1. Deposit £1.

Nov. 18.—Limerick. Electrical installation at Mount St. Alphonsus College. C. Thompson, Architect, 65 O'Connell St., Limerick. Deposit £5 5s.

Nov. 20.—Dudley T.C. Supply and installation of 79 concrete columns, 250 mercury discharge lighting equipment on trunk road A.4123. Applications by above date to the Borough Engineer, Council House, Dudley. Deposit £5 5s.

Nov. 20.—Glenrothes. Electrical installation in 140 houses at Woodside. Secretary, Glenrothes Development Corporation, Woodside, Glenrothes, Fife. Deposit £2 2s.

Nov. 20.—Lancashire. Electrical installation and driveway lighting at Whitefield clinic and welfare centre. Applications by above date to County Architect, County Offices, Preston. Deposit £2.

Nov. 20.—Poole T.C. Electrical installation in 116 houses on Alderney Ave. estate. J. R. Barron, Borough Engineer and Surveyor, Municipal Buildings. Deposit £2 2s.

Nov. 21.—Inverkeithing. Erection of 85 street lighting columns on roads within burgh, with 3 ft. brackets; also supply and wiring of 86 lanterns with h.p.m.v. lamps and gear, time switches, etc. Burgh Surveyor, Thomas Cruickshank, Townhall St. Deposit £2 2s.

Nov. 22.—Romford T.C. Electrical installation to 92 houses on Masefield Cres. estate. Borough Engineer and Surveyor, Town Hall. Deposit £2 2s. (See Nov. 2 issue.)

Nov. 22.—Wakefield. Supply and erection of 21 mercury vapour lamps on concrete columns. Street Lighting Superintendent, King Street.

Nov. 22.—Warrington T.C. Electrical installation and stage lighting at Christ Church Parish Rooms, Latchford. Borough Surveyor, Town Hall.

Nov. 23.—Huntingdon R.D.C. Wiring for electricity in 6 houses at Old Weston. Surveyor Montagu House.

Nov. 24.—Bedfordshire. Installation of electric lighting to county primary school at Leighton Buzzard. County Architect, Shire Hall, Bedford.

Nov. 24.—Belfast. Fire-fighting equipment for protection of 33 kV switchgear for Mountpottinger substation, Thorndyke St. Merz and McLellan, Consulting Engineers, Carliol House, Newcastle-on-Tyne 1. Deposit £5 5s. (See Oct. 19 issue.)

Nov. 24.—Stockport T.C. Supply and erection of 200 lighting columns and installation of lanterns and control gear. Also supply of 200 lanterns, chokes and capacitors for 400 W horizontal mercury vapour discharge lighting. Wm. F. Gardner, Borough Surveyor, Town Hall, Stockport. (See Nov. 2 issue.)

Nov. 25.—Armagh. Electrical work at Portadown maternity and child welfare centre. Architects are Houston and Beaumont, 6 Union St., Lurgan. Deposit £3 3s.

Nov. 25.—Sutherland. Electrical work in 42 houses on various sites. Architect: E. W. Brannen, Carnegie Buildings, Dornoch.

Nov. 25.—Selkirk. Electrical work in 21 houses on Philiphaugh site. W. Y. Carmichael, Town Clerk, Town Clerk's Office.

Nov. 27.—Belfast. Supply of electric lamps and electrical equipment for Ministry of Finance, Govt. of N. Ireland. Room 103, Law Courts Building, May St.

Nov. 27.—Gillingham T.C. Electrical installations in 105 houses on the Eastcourt/Twydall estate. Borough Engineer and Surveyor, Municipal Buildings, Gillingham, Kent.

Nov. 28.—Bedfordshire. Installation of electric lighting in classrooms to be built at Pearcey Rd. school, Bedford. County Architect, Shire Hall, Bedford.

Nov. 29.—Clondalkin (Co. Dublin). Electrical installation in Dublin Fever Hospital at Blackditch. J. A. Kenny and Partners, Consulting Engineers, 44 Kildare St., Dublin C.17. Deposit £26 5s.

Nov. 30.—Frimley and Camberley U.D.C. Installation of electric lighting in 62 houses on various sites. Engineer and Surveyor, Municipal Buildings, Camberley. (See Nov. 9 issue.)

Nov. 30.—Poulton-le-Fylde (Lancs.) U.D.C. Electrical installation in 11 houses and 8 flats on three sites. Hall and Hedges, Architects, Barclay's Bank Chambers, Birley St., Blackpool.

Nov. 30.—Slough T.C. Supply and erection of concrete columns and 400 W mercury vapour lighting equipment in William St. and Stoke Rd. Borough Engineer, Town Hall, Deposit £2 2s. (See Nov. 9 issue.)

Dec. 1.—Blackpool T.C. Supply of 250 concrete columns and bracket arms; 200 light alloy lanterns; 185 chokes and capacitors for 400 W H.P.M.V. and 15 for 250 W H.P.M.V.; 50 similar lanterns with outer bowl refractors. Also 260 concrete columns, 260 light alloy lanterns, and 500 synchronous motor time switches. Tenders to Trevor T. Jones, Town Clerk. (Advertised in this issue.)

Dec. 4.—Stockport T.C. Electric lighting and power installation in (a) 66 houses (b) 31 houses at Brimington, and (c) 65 houses at Thornley Lane. Applications to Borough Surveyor, Town Hall, Stockport, by November 22.

Dec. 4.—West Bridgford U.D.C. Supply and erection of 61 concrete columns with 140 W sodium enclosed lanterns and ancillary equipment over 1¼ miles on Loughborough Rd. Engineer and Surveyor to the Council, R. C. Dewsberry, The Hall, West Bridgford, Notts. Deposit £2 2s.

Dec. 8.—Belfast T.C. Supply and erection of vertical spindle centrifugal type drainage pumps, pipework and equipment at Harbour power station. Merz and McLellan, Consulting Engineers, Carliol House, Newcastle-on-Tyne 1. Deposit £5 5s. (See Nov. 2 issue.)

Dec. 11.—Dublin. A.C. motor-d.c. generator set direct coupled on combination bed plate. D.C. generator compound wound continuously rated 5 kW, 110 V. Technical Schools, Bolton St., Dublin.

Dec. 13.—Aireborough U.D.C. Reinforced columns and brackets, also supply of lanterns and auxiliary gear for installation of fluorescent street lighting along 2¼ miles of Leeds Rd. Engineer and Surveyor to Council, Council Offices, Rawdon, nr. Leeds. Deposit £2 2s. (See Oct. 12 issue.)

Dec. 14.—Isle of Ely. Electrical installation in infants' school at Downham Rd. County Architect. R. D. Robson,County Hall, March, by Nov. 20. Dep. £2 2s.

Dec. 16.—Swinton and Pendlebury. Supply and erection of concrete columns, bracket arms and wiring, and supply of lanterns, lamps and auxiliary gear for Manchester-Bolton (A.666) Rd. Borough Engineer and Surveyor, Town Hall, Swinton, Lancs. Deposit £2 2s. (Advertised in this issue.)

Dec. 21.—Denbighshire. Electric lighting and power installation in primary and infants' schools at Queen's Park, Wrexham. Applications to County Architect, Grove Park, Wrexham, by Nov 27. Deposit £3 3s. (Advertised in this issue.)

No date stated.—Aberdeen. Electrical work for erection of janitor's house at Cummings Park primary school, and porches to Kittybrewster primary school. J. A. O. Allan, Ross and Allan, Architects, 10 Bon-Accord Sq., Aberdeen.

No date stated.—Darlington T.C. Electrical installation at New Eastbourne primary school. Borough Architect, E. A. Tornbohm, Central Buildings, Darlington.

No date stated.—Ryton-on-Tyne U.D.C. Electrical installations in 46 houses on Garden House estate, Crawcrook. Surveyor, Council Offices, Ryton.

No date stated.—Bristol. Exterior lighting in grounds of Stapleton Hospital. Documents from D. Pearson, Secretary, Stapleton Hospital. Management Committee, 200 Manor Rd., Fishponds, Bristol.

OVERSEAS

*Details of items marked * may be obtained on application to Room 1076, Board of Trade, Thames House, North Millbank, S.W.1, quoting reference.*

Nov. 22.—Portuguese East Africa. Motor alternator, 70 kVA, 220/380 V, and control panel for Permanent Purchasing Commission, Mozambique Treasury Dept., Lourenco Marques. B.o.T. (Ref. CRE (IB) 69555/50).*

Nov. 22.—Belgium. Belgian State Railways require 10 transformers 400 VA, 200 transformers 15 VA, 100 transformers 50 VA. B.o.T. (Ref. CRE (IB) 69747/50).*

Dec. 6.—Johannesburg. Lifting magnet to lift one ton, suitable for operation on a 2-ton overhead electric workshops crane for South African Railways. Chief Stores Superintendent, P.O. Box 8617, Johannesburg.

Dec. 19.—Bloemfontein. Supply and installation of all electric lighting equipment at Mazelspoort filtration and pulp station, Documents from Council's Consulting Engineers, Ninham Shand, 806 Groote Kerk Building, Parliament St., Cape Town.

Dec. 22.—Uruguay. Administracion de las Usinas Electricas y los Telfonos del Estado require 60 tertiary selectors and 40 repeaters for changing from three to two wires. B.o.T. (Ref. CRE (IB) 69958/50).*

Dec. 27.—Uruguay. Usinas Electricas y Telefonos del Estado invite traders for 34 distributors for an entry of from 100 to 800 pairs, also protection strips for 2,000 incoming pairs. B.o.T. (Ref. CRE (IB) 68991/50).*

Dec. 28.—Johannesburg. Supply of electric tyre heaters, preferably the induction type, capable of accommodating locomotive, tender, electric unit and carriage and wagon tyres between 2 ft 3½ in. and 6 ft in size. Maximum temperature 400°C. South African Railways Stores Dept., P.O. Box 8617, Johannesburg.

Jan. 12.—Durban. City's Electricity Dept. invites tenders for 32 transformers between 25 and 1,500 kVA, and 6,600/550 and 33,000/6,600 V.

Jan. 27.—Pakistan. Supply of 32 metre gauge (3 ft 3⅜ in.) express and goods diesel electric locomotives for Eastern Bengal Railway. Documents from Supply and Stores Dept., Office of High Commissioner for Pakistan, 40 Lowndes Sq., S.W.1. Deposit £15.

March 20.—Wellington (N.Z.). 100 MVA, 11,000 V switchgear of single busbar indoor metal clad drawout type with accessories, comprising a 6-panel switchboard (1 incoming panel and 5 feeder panels), bus oil immersed isolator switch, bus potential transformer, outdoor current transformer. State Hydro-Electric Dept.

Your Queries — Answered

"Maxivee" switches, makers of? D.G.—Manuus Mfg. Co. Ltd., 270/276 Bearwood Rd., Smethwick, Birmingham. (19006)

Unit heaters for d.c. (as a standard line), makers of? J.B.—Standard and Pochin Bros. Ltd., Evington Valley Rd., Leicester. (19009)

"Variostat" control, makers of? E.C.—Drayton Regulator and Instrument Co. Ltd., West Drayton, Middx. (19018)

"Mettric" switchgear, makers of? B.C.—J. G. Statter and Co. Ltd., 82 Victoria St., S.W.1. (19024)

"Uniglow" fires, makers of? D.P.—H. W. Sullivan Ltd., 72 Leo St., S.E.15. (19037)

"Nelson" blankets, makers of? K.R.—Electro-Medical Blankets Ltd., 41 Shudehill, Manchester 4. (19027)

"Walglow" fires, makers of? D.P.—Walsall Conduits Ltd., Excelsior Works, West Bromwich. (19036)

"Sunhouse" fires, makers of? B.H.—H. Frost and Co., Fieldgate, Walsall. (19042)

Inventum Elec. Appliances, Ltd., address of ? T. E.—This firm, which was of Dutch origin, was last known at 61, Lowlands Rd., Harrow but we have been unable to find any trace of this firm since 1942. (19047)

The above are selected from questions we have answered this week. If you have a query, send it to us.

April 3.—Wellington (N.Z.). State Hydro-Electric Dept. invite tenders for 1-5,000 kVA 110/11 kV transformer bank and spare unit comprising four transformer units each 1,667 kVA 110/6·35 kV, for Waitaki power station. B.o.T. (Ref. CRE (IB) 70084/50).*

April 17.—Wellington (N.Z.). State Hydro-Electric Dept. want a 5,000 kVA 11/10/6·6 kV transformer bank and spare unit for Dobson substation. Documents available at N.Z. Govt. Offices, John Adam St., W.C.2.

CONTRACTS PLACED

Kingston-on-Thames T.C. Traffic signals at Thames St., Automatic Telephone and Electric Co. Ltd., £1,950.

Lancaster. Supply of 83 street lighting lanterns with lamps. G.E.C., £1,551.

L.C.C. Electrical installation at Honeywell Rd. school, Battersea. Honor Bros., Ltd.

Macclesfield. Supply and erection of 120 concrete street lighting columns, and installation of 140 W sodium lamps and lanterns; also 29 tubular steel columns and 3/80 W fluorescent lamps and lanterns. N.W. Electricity Board, £9,471.

Sheffield. Electric lighting in Acres Hill infants' school. Yorkshire Electricity Board, £2,150; installations in houses on two estates and a bus garage. Hall and Stinson Ltd., £20,054.

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Hoover. B680,079. Class 7 Washing machines, motors, clothes rinsing, shoe polishing, window cleaning machines, butter churns, floor polishing and waxing machines, hairdressing machines, etc. B680,778 Class 11. Clothes drying, toasting, refrigerating and room-heating apparatus, etc. Hoover Ltd., Perivale, Greenford, Middx.

Parpak/Contro. 688,867. Electrical apparatus and instruments in Class 9. Leeds Model Co. Ltd., Potterdale Mills, Dewsbury Rd, Leeds 11.

Superclad. 690,401. Class 9. Electric batteries. Park Bros. Ltd., Brunswick Works, Canterbury St., Blackburn.

PRICES OF CABLE METALS AND OTHER MATERIALS
(at Tuesday night)

	£ s. d.	New York price
COPPER, electrolytic	202 0 0	£196 0 0
Delivered in 2nd and 3rd month after order	215 10 0	—
Delivered in 4th, 5th and 6th month after order	217 0 0	—
LEAD, good soft pig (foreign)	136 0 0	136 0 0
" " "English" quality	137 10 0	
Delivered in 2nd and 3rd month after order, plus	7 0 0	
TIN (99·99·75%) (Cash)	1065-1075	—
" (3 months)	1035-1040	—
ALUMINIUM, commercial purity (del.)	120 0 0	—
ZINC	151 0 0	140 0 0
ARMOURING:		
Galv. Steel Wire (0.104 in.)	45 10 0	—
Mild Steel Tape (0.04 in.)	26 0 0	—

GAZETTE ANNOUNCEMENTS

COMPANIES ACTS

Barwell Electrical Products Ltd. Petition for winding-up to be heard at High Court of Justice on November 20. Persons intending to appear must notify Cochrane and Cripwell, 119 Finsbury Pavement, London, by November 18.

Shick Dry Shaver (England) Ltd. Resolution for voluntary winding-up passed at meeting on November 7. Peter W. Mertens, of 112-114 Cannon St., E.C.4., appointed liquidator.

Trafford Battery Co., Ltd., Meetings of members and creditors at Faraday House, Todd St., Manchester 3, on December 4 at 10 and 10.30 a.m. respectively, to receive liquidator's report.

Intended Dividend

London. Harrison and Co. (Electrical), Ltd., wireless and electrical engineers of 6 Broad St. Place, E.C.2. Last day for receiving proofs, November 24. Liquidator is A. E. Attwood, 20 Lawrence Lane, Cheapside, E.C.2.

BANKRUPTCY ACTS

First Meetings

Bangor. David L. Smith, electrical contractor, trading at Midland Bank Chambers, Cefn Rd., Old Colwyn. First meeting at Official Receiver's Office, West Africa House, Water St., Liverpool 2, on November 16 at 11 a.m. Public Examination at Court House, Deiniol Rd., Bangor, on December 15 at 11.30 a.m. Date of Receiving Order, November 3.

Wandsworth. H. Walby, electrical engineer, of 86 Hill Rise, Richmond. First meeting at 3 Central Bldgs., Matthew Parker St., S.W.1, on November 21 at 11 a.m. Public examination at the Court House, Garrett Lane, Wandsworth, on January 19 at 10.30 a.m.

Receiving Order

Shrewsbury. Frederick A. Walmesley, trading as electrical contractor at 48 Wyle Cop, Shrewsbury. Date of receiving order, November 4.

Partnership Dissolved

Leicester. John Stubbs and Douglas Turner, trading as S.R.M. Television Co., manufacturers of television and radio equipment, at 1-3 West Ave., and 102 and 104 Asfordby St. Partnership dissolved as from July 31. Arthur Sherlock became a partner from the same date and will continue business with Douglas Turner. All debts will be paid by these two.

TRADE NOTES

Change of Address.—G. H. Lucas and Co. (agents for the Truvox Engineering Co.) have moved to 7 Albert Place, Bridge St., Manchester. Telephone, Blackfriars 8582.

Agents.—Everett, Edgcumbe and Co., Ltd., have appointed Messrs. Instruments and Controls (J. L. Record), Sandiway Place, Manchester Rd., Altrincham (Telephone Alt. 1393), as their agents in Lancashire, Yorkshire, Cheshire and North Wales.

Turkish Imports.—The Turkish Minister of Economy and Commerce has issued new decrees making changes in import regulations. There are five lists of importable products, but no electrical equipment is included in Section A which refers to goods which may be imported with licence.

BUSINESS PROSPECTS

HOME

Belfast. Council to apply for sanction to borrow £7,800 for installation of electric lighting in Central Library, Royal Ave.

Birkenhead. Erection of police headquarters. Willinck and Dod, Cunard Building, Liverpool 3.

Burnley T.C. Tenders to be invited for erection of police headquarters and magistrates courts at estimated cost of £267,964.

Caernarvonshire. Erection primary school at Bodfenrig. County Architect, County Offices, Caernarvon.

Cardiganshire. Erection of primary school at Penparcau, Aberystwyth. County Architect, George R. Bruce, County Hall, Aberayron.

Castle Donington (Derby) R.D.C. Erection of 70 houses on two sites. McCarthy, Collings and Co., Chartered Architects, 187 Forest Rd., Coalville.

Castle Ward (Northumberland) R.D.C. Erection of 16 houses and 12 bungalows at Ponteland. G. E. Dimmack, engineer and surveyor, 7 North Rd., Ponteland.

Colchester T.C. Erection of 60 houses on Shrub End site. J. S. Orchard, Borough Engineer, 64 West Stockwell St.

Cookham (Berks) R.D.C. Plans approved for erection of 20 houses on Woodlands Park site.

Derbyshire. Erection of schools at Beighton, Kilburn, Buxton and Clay Cross. County Architect, County Offices, St. Mary's Gate, Derby.

Devizes. Erection of 20 houses on Home Farm estate. J. D. Sheasby, Borough Surveyor, The Chequers, Devizes.

Elland (Yorks). U.D.C. applied for sanction to borrow £31,059 for erection of 28 flats on Stainland site.

Finchley. Erection of church in High Rd., N.2.

Flintshire. Erection of Technical College at Kelsterton. W. Griffiths, Deputy County Architect, Llwynegrin, Mold.

Gravesend T.C. Erection of 48 houses on Valley Drive site. Borough Engineer and Surveyor, 6 Woodville Terrace.

Harwich T.C. Plans being prepared for erection of 32 houses and flats.

Huyton - with - Roby (Lancs) U.D.C. Plans approved for erection of 160 houses on St. John's Rd. East estate.

Isle of Ely. Erection of infants' school at Chatteris. County Architect, R. D. Robson, County Hall, March.

Leyland R.D.C. Erection of 60 houses and 20 flats on Broadfield estate. F. D. Howe, engineer and surveyor, Council Offices, Leyland.

Lleyn (Caernarvon). R.D.C. to erect 68 houses on various sites; also to invite tenders for erection of 8 houses at Llanystumdwy.

Manchester. Council to apply for sanction to borrow £95,620 for erection of Poundswick county primary school, £87,625 for Woodhouse Lane county primary school, and £18,250 for police premises at Wythenshawe.

Merthyr Tydfil. Erection of primary school at Ysgubor Newydd. Architects: T. Edmund Rees, Richards and Trollope, "Arosfa," The Grove, and at 14 Sackville St., W.1.

Richmond (Yorks). Tenders being obtained for erection of 50 houses and flats on Westfield (South) estate. Needham and Thorp, 6 High Petergate, York.

Samford (Suffolk) R.D.C. Tenders to be invited shortly for erection of 24 houses at Brantham.

Sleaford U.D.C. Erection of 32 houses on Galley Hill estate. Council Architects, F. J. Lenton and Partners, 16 Finkin St., Grantham.

Sedgley (Staffs). U.D.C. proposes to erect 48 houses at Moden Hill, 28 in Bird St., 24 at Gibbons Hill, 16 at Hickmerelands Lane, and 6 at Ellowes Rd.

Southampton. Erection of 246 flats in 14 blocks on Milbrook Estate. Also rebuilding of Regents Park infants' school in Richville Rd.

Stocksbridge U.D.C. Erection of 24 houses on Stubbin Farm estate. Husband and Co., 388 Glossop Rd., Sheffield 10.

Sunderland T.C. Tenders to be invited for a cafeteria. Plans by Borough Architect, Grange Hse., Stockton Rd.

Tunbridge Wells. Erection of 26 houses and 16 flats, 4 houses and 4 flats, and 8 houses and 28 flats on Ramslye estate. Separate contracts. Hugh P. Bishop, Borough Surveyor, Town Hall.

West Riding. Erection of Wath Park Rd. primary school. County Architect, "Bishopsgarth," Westfield Rd., Wakefield.

Weymouth and Melcombe. Erection of 66 houses on Downclose estate. Borough Engineer and Surveyor, 6 Pulteney Buildings.

Wimbledon T.C. Erection of flats: 6 blocks in Lake Rd., 2 blocks in Haydons Rd., 2 blocks and 6 houses in Cliveden Rd. T. Webster, Borough Engineer and Surveyor, Town Hall.

OVERSEAS

Belgian Congo. Atlas-Bobinage, Petit Pont, Kalina, Leopoldville, want to represent U.K. manufacturers of domestic fans, belt pulleys and paraffin refrigerators.

Columbia. Robledo Hermanos, Apartado Aereo 4558, Bogota, want electric motors for 110, 150 and 220 V, and generators for a.c. from 500 W to 20 kW.

India. Mr. H. M. Desai, of newly formed Union Conduits, Ltd., Bombay, is anxious to contact U.K. manufacturers prepared to work in partnership on a managing agents basis or as representatives. It is proposed that the manufacture of pipes and fittings will start next year and machinery is being bought by Mr. Desai, who can be contacted at 166 My Lady's Rd., Belfast.

Nyasaland. Central African Electrical Co., Central African Airways Terminal Bldg., Blantyre, Nyasaland, want to obtain distributing rights of U.K. manufacturers of electrical domestic appliances, motors, water pumps, generating and lighting plants, radio receiving sets, refrigerators, cable and lamps.

Persia. Ministry of Posts, Telegraphs and Telephones, Teheran, is inquiring for a converter comprising 3 x 190 V motor directly coupled to 30 kW dynamo, 220 V d.c.; also switchboard and one transformer, primary 3 x 190/110 V, secondary 3 x 380/220 V.

U.S.A. Consolidated Export Co., 417 Palace Building, Minneapolis, wishes to contact U.K. manufacturers of small electric motors of 110 V between ½ and ¾ h.p.

Also Mr. W. Simon, of Lawrence Elliott Co., 20011 Fairmount Boulevard, Cleveland, wants to contact U.K. manufacturers of electric lawn mower and domestic electrical appliances.

MEETINGS TO NOTE

THURSDAY, NOV. 16

I.E.S. (Gloucester and Cheltenham Centre).—"Lighting in the Home." Miss M. Wardlaw. Cadena Cafe, High St., Cheltenham. 6.30 p.m.

I.E.S. (Manchester Centre).—Dance. Plaza Ballroom.

I.E.E. (E. Midland Centre).—"Development and Design of Electrical Control Gear for Machine Tools." George Hotel, Kettering. 7.30 p.m.

I.E.E. (Irish Branch).—"The Chemist and Metallurgist in a Transport Company." Trinity College, Dublin. 6 p.m.

I.E.E. (N. Midland Centre).—"Automatic Control of Lead-Acid Battery Charging Equipment." R. A. Harvey. Yorkshire Elect. Board, Ferensway, Hull. 7.30 p.m.

I.E.E. (S. Midland Centre).—"Electronic Motor Control." C. R. Bates. G.E.C. Works, Coventry. 6.45 p.m.

FRIDAY, NOV. 17

ELECT. POWER ENGRS. ASSOC. (Midland Tech. Group).—"Electric Furnaces." Birlec & Co. Ltd. Elect. Board Showrooms, Paradise St. 7 p.m.

I.E.E. (N. E. Students' Section).—"Brazing by Electricity," L. C. Kerr. "Electricity Distribution," A. Jackson. King's College, Newcastle-on-Tyne. 6.30 p.m.

KEIGHLEY ASSOC. OF ENGRS.—"Modern Mining Machinery." L. W. L. Anderson. Devonshire Buildings, Devonshire St. 7.30 p.m.

SATURDAY, NOV. 18

A.S.E.E. (Oxford Branch).—"Radio Interference Suppression." Southern Elect. Board, George St. 3 p.m.

MONDAY, NOV. 20

A.S.E.E. (Central London Branch).—"Electricity in Agriculture." W. Cover. St. Ermin's Hotel, S.W.1. 6.50 p.m.

BIRMINGHAM ELECT. CLUB.—"The Story of Copper from the Mining Side Onwards." H. J. Miller.

BRITISH INSTN. OF RADIO ENGRS. (London Section).—"Ultrasonic Generators for High Powers." B. E. Noltingk. London School of Hygiene, Gower St., W.C.1. 6.30 p.m.

I.E.E. (London Radio Section).—"The Nervous System as a Communication Network." J. A. V. Bates. Savoy Place, W.C.2. 5.30 p.m.

I.E.E. (Mersey and N. Wales Centre).—"Design Specification and Performance of high-voltage Surge Diverters." H. F. Jones and C. T. O. Garrard. Town Hall, Chester. 6.30 p.m.

I.E.E. (N. E. Radio Group).—"A New Precision A.C. Voltage Stabiliser." G. N. Patchett. King's College, Newcastle. 6.15 p.m.

TUESDAY, NOV. 21

INSTN. OF HEATING AND VENTILATING ENGRS. (Manchester Branch).—Ladies' evening. Longford Hall, Stretford.

I.E.E. (Scottish Centre).—Dinner-dance. Grosvenor Restaurant, Glasgow. 6 p.m.

I.E.E. (E. Midland Centre).—"Reconstruction of Italian State Telecommunications 1943-45." Maj. H. E. Knight. Loughborough College. 6.30 p.m.

I.E.E. (N. W. Measurements Group).—"Routine Testing Equipment for Transformer Steels." N. F. Astbury, T. Emmerson, and J. McFarlane. Engineers' Club, Albert Sq., Manchester. 6.15 p.m.

INC. PLANT ENGRS. (Glasgow branch).—"Experiences in the sale of Heat." G. A. Rooley. 351 Sauchiehall St. 7 p.m.

A.S.E.E. (London).—"Electricity in the Aeronautical Industry." E. E. Buckell. Magnet House, Kingsway, W.C.2. 6.30 p.m.

WEDNESDAY, NOV. 22

BRIT. INSTN. OF RADIO ENGRS. (W. Midlands Section).—"The Quality of Electrical Reproduction and its effect on Receiver Design." 7 p.m.

INST. OF WORKS MANAGERS (Merseyside Branch).—Annual luncheon. Principal guest : John Ryan of Metal Box Co. Adelphi Hotel, Liverpool. 6.30 p.m.

I.E.E. (London Supply Section).—"The influence of Rectifier Harmonics in a Railway System on the Dielectric Stability of 33kV cables." S. B. Warder, E. Friedlander and A. N. Arman. Savoy Place, W.C.2. 5.30 p.m.

I.E.E. (N. Lancs sub-centre).—"Cost and Efficiency of Earthing on low and medium voltage Overhead Line Systems." L. Gosland. N.W. E.B., Darwen St., Blackburn. 7 p.m.

I.E.E. (Southern Centre).—Discussion on "Standardisation." Tech. College, Brighton. 6.30 p.m.

I.E.E. (Bristol Students' Section).—"Speed Control of Induction Motors." D. C. Flack. Westinghouse Works, Chippenham. 7 p.m.

INST. OF MECHANICAL ENGRS.—"Application of Gas-Turbine Technique to Steam Power." J. F. Field. University College, Southampton.

THURSDAY, NOV. 23

I.E.S. (Bradford Group).—"Lighting in the Home." Miss M. Wardlaw. Yorkshire Elect. Board, Sunbridge Rd. 7.30 p.m.

I.E.E. (Tees-side sub-centre).—Annual dinner and President's visit. Zetland Hotel, Saltburn. 7 p.m.

I.E.E. (Rugby sub-centre).—Faraday lecture. "Illumination." L. J. Davies. Temple Speech Room, Rugby.

INST. OF FUEL.—"Performance and Efficiency of an 800 lb/sq in Pulverised-fuel-fired Boiler Plant Over a Period of 20 Years." Dr. J. A. Cooper and L. W. Young. Inst. of Mechanical Engrs., Storey's Gate, S.W.1. 5.30 p.m.

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons, Ltd., 116 Chancery Lane, London, W.C.2.

G. K. Distributors (Durham) Ltd. Wholesalers and retailers of elec. components, etc. Nominal cap.: £1,000. Dirs.: to be apptd. by subs. Subs.: A. J. C. Hirst, Bull Green Hse., Halifax, and Margaret R. Monk.

G. K. Distributors (Gateshead) Ltd. Wholesalers and retailers of elec. components, etc. Nominal cap.: £1,000. Dirs.: to be apptd. by subs. Subs.: as above.

Electronics (Leeds), Ltd., Canal Lane, Lofthouse Gate, nr. Wakefield. To take over business of an electrical contractor carried on at Lofthouse Gate, nr. Wakefield, by Albert A. Haycock as "Hayco Electronics," etc. Nominal cap.: £1,000 in £1 shares. Permanent dirs.: J. H. Thompson, Mrs. K. A. T. Thompson and A. A. Haycock.

Refrigeration Insulation Co. (Chingford) Ltd., 28 Carlyon Rd., Alperton, Middlesex. Nominal cap.: £500 in £1 shares. Dirs.: L. G. Lindsell, A. R. Botten, C. F. Lindsell, H. H. Lindsell and G. H. Dewell.

Wm. Hamilton and Co. (Woking) Ltd., Sheerwater Estate, Woking. Civil, elec. and genl. engrs., etc. Nom. cap.: £3,000. Dirs.: W. Hamilton and F. C. Adlam.

Jarvis and Evered, Ltd., 11a Kingston Rd., Taunton, Som. Electricians, etc. Nom. cap.: £6,500. Dirs.: B. J. Freestone, A. E. Howe, and W. Cann.

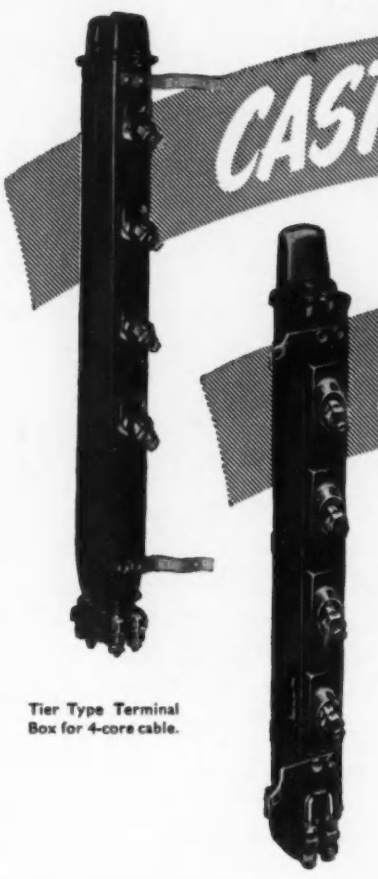
Lymelite Electrical Industries Ltd., 15 Highbury Quadrant, N.5. Nominal cap.: £4,000 in £1 shares. Dirs.: M. Alder, A. Karat, F. G. Moon and D. A. V. Rist.

Max Arc and Electrics, Ltd., 190 Thornton Rd., Croydon, Surrey. Nom. cap.: £100. Dirs.: P. S. E. Jackson, J. L. Jeffree, and J. R. Oliver.

Midland Transformer Co., Ltd., 38 Freeth St., Ladywood, Birmingham 16. Elec., radio and mech. engrs., etc. Nom. cap.: £10,000. Dirs.: E. A. Hinksman and H. M. Stevenson.

J. and S. Wilkins Ltd., 24 Belmont Circle, Harrow, Middx. To take over business of radio and television dealers carried on at 346 High Rd., Leytonstone, E.11, by T. Wilkins and Sons, and at 24 Belmont Circle, Harrow, by John H. K. Wilkins. Nominal cap.: £2,000 in £1 shares. Dirs.: J. H. S. Wilkins and S. E. Wilkins.

CAST IRON or SHEET STEEL



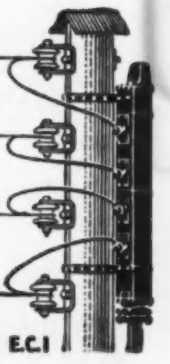
Tier Type Terminal Box for 4-core cable.

The HENLEY Tier Type Terminal Box familiar to many engineers is now available in CAST IRON or SHEET STEEL, whichever you prefer. These boxes solve the problem of terminating overhead low tension lines arranged in vertical formation. Jointing is easy. Available for multicore cables up to 660v. Described in Catalogue 50.

HENLEY

tier type terminal boxes

Write for Catalogue 50.



W. T. HENLEY'S TELEGRAPH WORKS CO. LTD., 51-53 HATTON GARDEN, LONDON, E.C.1

Testing made easy . . .

The equipment illustrated embodies the necessary control apparatus for testing both single-phase and polyphase watt-hour meters up to a maximum current of 1,000 amperes (or alternatively 500 amperes) and up to 500 volts phase-to-neutral. The equipment is designed for operation from a three-phase, four-wire supply and can be adapted for operation between 346/200 volts and 440/254 volts.

. . . with

POLYPHASE

METER TESTING EQUIPMENT

Outstanding features of this equipment.

- **Exceptionally smart appearance and finish.**
- **Simplicity of control.**
- **All component parts accessible for inspection.**
- **Infinitely fine control of voltage and current from zero to maximum and of power-factor from zero lead to zero lag.**
- **Indicating instruments of high accuracy.**
- **Arrangement of heavy-current conductors to give minimum stray field effect.**
- **Starting-current testing without interfering with other routine tests.**

Typical Testing Rack for Polyphase Meters

METROPOLITAN-VICKERS ELECTRICAL CO. LTD., TRAFFORD PARK, MANCHESTER 17

Member of the A.E.I. group of companies

METROVICK *Instruments for precision testing*

G/A011

CLASSIFIED ADVERTISEMENTS

OFFICIAL TENDERS AND APPOINTMENTS

WANTED · FOR SALE WORK WANTED

Those wishing to advertise in these pages should send the text to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia St., W.C.2, before 10 a.m. on TUESDAY of week of issue. Official Displayed Advertisements are charged at 35s. per inch, and all other classified advertisements at 2s. 6d. per line. Situations Wanted will be published four times for twice the single insertion rate. Fee for Box No. and postage on replies is 2s.

TENDERS INVITED

ROYAL BURGH OF INVERKEITHING

STREET LIGHTING
TRUNK ROADS A92 & 90, CLASS 1 ROAD A9, AND CLASS III ROADS
INSTALLATION OF ELECTRIC STREET LAMPS

TENDERS are invited for the Provision, Erection and Wiring complete of 85 STREET LIGHTING COLUMNS on the above mentioned roads within the Burgh. The contract includes for the supply, delivery, erection complete of 85 steel columns, with 3 ft bracket, 25 ft mounting height; also for the supply, delivery, wiring and fixing of 86 lanterns with H.P.M.V. lamps and gear, time-switches, etc., and putting the installation into operation.

Specifications, schedules and forms of tender can be obtained from the Burgh Surveyor, Mr. Thomas Cruickshank, Townhall Street, Inverkeithing, upon payment of a deposit of Two Guineas, which will be returned on receipt of a bona fide tender. Detailed plans of the layout, etc., can be examined in the office of the Burgh Surveyor.

Tenders should be returned in a plain, sealed envelope, endorsed "STREET LIGHTING" addressed to the undersigned, so as to be received not later than 10 a.m. on November 21, 1950. The Council does not bind itself to accept the lowest, or any tender, and the provisional acceptance of any tender is subject to the approval of the Minister of Transport.

JAMES SCOTT,
Town Clerk.

Town Clerk's Office,
Heriot Street, Inverkeithing, Fife.
October 27, 1950 (G 632)

BLACKPOOL CORPORATION

TENDERS are invited by the Corporation for the supply and delivery of the following STREET LIGHTING EQUIPMENT. The Corporation do not bind themselves to accept the lowest, or any tender, and may accept tenders for the whole or any part of the schedule.

The general conditions pertaining to the tender will be in accordance with those set out by the Institution of Electrical Engineers in their Model Form "C" for "Goods other than cables." No further specifications will be issued, and the time of delivery, from the date of placing order, is to be stated in the tender.

Separate tenders for each part are to be addressed to the undersigned and delivered in plain envelopes endorsed "Street Lighting Equipment," (A) to (G) as required but not bearing any name or mark indicating the sender, not later than Friday, December 1, 1950.

GROUP "A" ROAD LIGHTING

(A) 250 reinforced concrete columns with smooth ground finish suitable for side entry type lanterns at 25 ft mounting height. Manufacturing details to be supplied with tender. Bracket arms of different lengths will be required (2 ft 6 in., 3 ft 6 in., 5 ft and 6 ft) and the respective prices for each should be quoted.

(B) 200 enclosed light alloy lanterns designed for medium angle beam and non-axial distribution suitable for horizontal burning H.P.M.V. lamps. Specification including full data on luminous output, with Iso-candle chart, are to be supplied with the tender.

(C) 200 solid wax-filled chokes and capacitors (185 for 400W H.P.M.V. and 15 for 250 W H.P.M.V.).

(D) 50 enclosed light alloy lanterns with outer bowl refractors designed for medium angle beam and non-axial distribution suitable for vertical burning 500 W Tungsten lamps. Specification including full data on luminous output, with Iso-candle chart, are to be supplied with the tender.

(Continued in next column)

(Continued from previous column)

GROUP "B" ROAD LIGHTING.

(E) 260 reinforced concrete columns with smooth ground finish and with standard bracket suitable for side entry or suspension type lanterns at 15 ft mounting height. Manufacturing details to be supplied with tender.

(F) 260 enclosed light alloy lanterns either with inside dome refractors and outer clear globes, or with bowl refractors designed for medium angle beam and non-axial distribution suitable for vertical burning 100/200 W Tungsten lamps.

(G) 500/200/250 V synchronous Motor time switches, 10 amp or 20 amp capacity, Solar Dial on and off with provision for additional off about midnight.

TREVOR T. JONES,
Town Clerk.
(G 676)

DENBIGHSHIRE EDUCATION AUTHORITY

TO HEATING AND ELECTRICAL ENGINEERS

CONTRACTORS desirous of submitting a Tender for either of the following works, viz.:

The Proposed Erection of Primary and Infants' Schools, adjacent to Deva Way, Queen's Park, Wrexham.

(a) Low Pressure Heating and Domestic Hot Water Installations. Tender based on plans and specification.

(b) Electric Lighting and Power Installation. Tender based on plans and specification

are invited to forward their names stating which of the works they desire to tender for, together with a deposit of £3 3s. (Three Guineas) for each job (which will be returned on receipt of a bona fide tender) to the County Architect, Grove Park, Wrexham, not later than Monday, November 27, 1950.

No application to tender will be accepted after this date.

The deposit cheque is to be made payable to the "Denbighshire Education Authority" and crossed "Midland Bank Ltd."

The specification and plans will be dispatched to Contractors desirous of tendering on or about Wednesday, December 6, 1950, and tenders are to be delivered by Thursday, December 21, 1950.

Contractors will be required to provide proof that they have the organisation and necessary labour to carry out this work.

The lowest or any tender will not necessarily be accepted nor will any allowance be made for estimates.

W. E. BUFTON,
Clerk of the County Council.
County Offices, Ruthin. (G 665)

BOROUGH OF SWINTON AND PENDLEBURY

TENDERS FOR STREET LIGHTING
MANCHESTER-BOLTON (A666) ROAD

TENDERS are invited for the following works:—

Contract 1.—The provision and erection of concrete columns, bracket arms and wiring, and

Contract 2.—The provision of lanterns, lamps and auxiliary equipment

for the above road, 2·80 miles long.

Plans and general conditions of contract may be inspected and specifications, bills of quantities, forms of tender obtained, on the deposit of £2 2s. from the office of the Borough Engineer and Surveyor, Town Hall, Swinton, Lancs.

Tenders will be considered for either or both contracts but the Corporation do not bind themselves to accept the lowest or any tender. Tenders in sealed envelopes, provided for the purpose and bearing no indication of the name of the tenderer, must be returned to Vincent Collinge Esq., Town Clerk, Town Hall, Swinton, Lancs., to reach him not later than the first post Saturday, December 16, 1950.

VINCENT COLLINGE,
Town Clerk.

Town Hall, Swinton, Lancs.
November, 1950 (G 675)

APPOINTMENTS VACANT

PROFESSIONAL ENGINEERS IN GOVERNMENT DEPARTMENTS

THE Civil Service Commissioners announce an Open Competition to be held during 1950 for permanent appointments of PROFESSIONAL ENGINEERS in many Departments of the Civil Service for a wide variety of engineering duties. Applications will be accepted at any time before December 31, 1950, and selected candidates will be interviewed as soon as possible after the receipt of their application forms. Candidates are advised to apply as early as possible.

AGE LIMITS: Candidates must be under 35 on November 30, 1950, with extension for regular service in H.M. Forces and for established Civil Service. For appointments in the Post Office they must be 21 or over, in the Ministry of Supply and the Ministry of Civil Aviation 23, and in all other Departments 25 or over on that date.

MINIMUM QUALIFICATIONS vary for different posts. Generally a University degree in Engineering or Corporate Membership of the Institutions of Mechanical Engineers, Electrical Engineers or Civil Engineers, or exemption from Sections A and B of the corresponding Associate Membership examinations, or evidence of exceptionally high professional attainment are required. For certain posts, Corporate Membership of the Institute of Fuel by examination or the Institution of Chemical Engineers, or Graduate Membership of the Institution of Chemical Engineers, or Associate Fellowship of the Royal Aeronautical Society or an Honours degree in Physics or Engineering will be accepted instead.

The salary on appointment will be fixed according to age. The salary for men aged 26 in London is £500 rising by annual increments of £25 to £750. Salaries for women and for posts outside London are lower. There are prospects of promotion to higher grades on scales for men in London of £750–£1,000, £1,050–£1,270, and above.

Further particulars and application forms from Secretary, Civil Service Commission, Trinidad House, Old Burlington Street, London W.1, quoting No. 3225. (G 662)

BRITISH ELECTRICITY AUTHORITY

South Western Division

DRAUGHTSMEN—GENERATION CONSTRUCTION DEPARTMENT

APPLICATIONS are invited for positions as Draughtsmen in the Generation Construction Department at Feeder Road, Bristol.

(a) DRAUGHTSMEN with good general engineering experience, preferably on mechanical work associated with modern Power Station equipment. The commencing salary will be within the provisional range £400–£550 per annum, according to experience and qualifications.

(b) JUNIOR DRAUGHTSMEN with general engineering training including Drawing Office experience. The commencing salary will be within the provisional range £300–£400 per annum, according to experience and qualifications.

The salary ranges quoted are to be regarded as provisional until final scales have been negotiated with the appropriate organisations.

The appointments will be superannuable in accordance with the British Electricity Authority and Area Boards' Superannuation Scheme.

Application forms may be obtained from the Divisional Secretary, British Electricity Authority, South Western Division, British Electricity House, 26 Oakfield Road, Bristol 8, to whom they should be returned so as to be received not later than November 30, 1950.

R. C. BARRETT,
Divisional Secretary.

November 8, 1950. (G 674)

BRITISH ELECTRICITY AUTHORITY

Midlands Division

APPLICATIONS are invited for the appointment of SHIFT CHARGE ENGINEER at Wolverhampton Generating Station, Class "E," Grade 7, commencing salary £579 per annum.

Applicants should have had sound technical training and practical experience in the control and operation of steam generating plant and main switchgear, or mechanical and electrical experience in a manufacturer's works. Qualified marine engineers with electrical experience would be considered suitable.

Salary and conditions of service will be in accordance with the N.J.B. Agreement, and superannuation under terms approved by the British Electricity Authority.

Applications should be made on forms obtainable from the Divisional Establishment Officer, 53 Wake Green Road, Moseley, Birmingham 13, and should be returned not later than December 2, 1950.

F. W. LAWTON,
Divisional Controller.
(G 673)

YORKSHIRE ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments:—

No. 6 (Hull) Sub-Area

JUNIOR ENGINEER (Goole District). (Vacancy No. 77/50).

Applicants should hold the Higher National Certificate in Electrical Engineering or equivalent qualifications, and have had training and experience in the construction, operation and maintenance of H.V. and L.V. overhead and underground distribution systems.

The successful applicant will be required to reside in Goole, and carry out standby duty.

Salary: N.J.B. Agreemert Class "E", Grade 14, £375 to £387 per annum.

Applications, stating the above vacancy number, giving full details of age, qualifications, and experience, should be forwarded to the Manager, No. 6 (Hull) Sub-Area, Ferensway, Hull, within 14 days of the appearance of this advertisement.

No. 7 (Grimsby) Sub-Area

JUNIOR ENGINEER (Gainsborough District). (Vacancy No. 77/50).

JUNIOR ENGINEER (Scunthorpe District). Two posts. (Vacancy No. 78/50).

Applicants should have had a good general and technical education and preference will be given to those possessing a recognised degree or certificate in electrical engineering. Applicants must also have had experience in the construction, operation and calculation of H.T. and L.T. underground and overhead mains systems and substations associated with urban and rural areas.

Salary: N.J.B. Agreement Class "E", Grade 14, £375–£387 per annum.

Applications, stating the above vacancy number, giving full details of age, qualifications, and experience, should be forwarded to the Manager, No. 7 (Grimsby) Sub-Area, Moss Road, Grimsby, within 14 days of the appearance of this advertisement. (G 636)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

APPOINTMENT OF ENGINEERING DRAUGHTSMAN

APPLICATIONS are invited for the appointment of Engineering Draughtsman in the department of the Sub-Area Engineer, No. 4/5 Sub-Area, Electricity House, Rhostyllen, near Wrexham.

The salary payable will be within the range £450–£500 per annum, according to qualifications and experience, and will be provisional and subject to such variation as may be necessary to confirm with the scales of salaries agreed after negotiation with the appropriate staff organisation.

Applicants should possess the Ordinary National Certificate in Engineering and have had experience in a drawing office of substation building work, and overhead line design. A knowledge of structural steel work would be considered an advantage.

Appointment will be superannuable and subject to medical examination.

Application forms obtainable from the Manager, No. 4/5 Sub-Area, Merseyside and North Wales Electricity Board, Electricity House, Rhostyllen, near Wrexham, should be completed and returned to him not later than November 30, 1950.

JAMES RANKIN,
Secretary.

November 10, 1950. (G 699)

BRITISH ELECTRICITY AUTHORITY

Yorkshire Division

THIRD ASSISTANT ENGINEER (MECHANICAL) GENERATION (CONSTRUCTION) DEPARTMENT

APPLICATIONS are invited for an appointment as Third Assistant Engineer (Mechanical) in the Generation (Construction) Department.

Applicants should possess the Higher National Certificate or equivalent qualifications and have had works and drawing office experience. The successful candidate will be required to carry out duties in connection with the preparation of specifications and the installation of mechanical equipment for power stations.

The commencing salary will be within Grade 5 of Schedule "C" of the National Joint Board Agreement, i.e., £579 per annum to £710 per annum, according to qualifications and experience, rising ultimately to a maximum of £776 per annum.

The appointment will be subject to the provisions of the Authority's Superannuation Scheme.

Forms of application may be obtained from the Divisional Secretary, British Electricity Authority, Yorkshire Division, British Electricity House, St. Mary's Road, Leeds 7, to whom completed forms should be returned not later than November 30, 1950. Envelopes to be endorsed "Third Assistant Engineer (Mech.)."

G. A. VOWLES,
Divisional Controller.
(G 660)

BRITISH ELECTRICITY AUTHORITY

London Division

ELECTRICAL MAINTENANCE ENGINEER

Hackney Generating Station

APPLICATIONS are invited for the above position. The successful candidate will be required to undertake all electrical maintenance work in the station, including main switchgear, transformers and auxiliaries, and must have served an apprenticeship.

Salary in accordance with the revised N.J.B. Schedule, Class "F," Grade 6, plus London allowance = £693 per annum.

ELECTRICAL MAINTENANCE ENGINEER

Taylor's Lane Generating Station

Applications are invited for the above position. Applicants must have a sound technical and practical training with an electrical engineering bias followed by experience in the maintenance of E.H.T. and L.T. switchgear in a modern power station. Salary in accordance with the revised N.J.B. Schedule, Class "F," Grade 7, plus London allowance = £656 5s. per annum.

Applications for both the foregoing vacancies, stating age, qualifications and experience, should be addressed to the Divisional Secretary, British Electricity Authority, London Division, Ergon House, Horseferry Road, Westminster, S.W.1, to be received within fourteen days of the publication of this advertisement.

J. N. WAITE,
Divisional Controller.
(G 691)

SINGAPORE MUNICIPALITY

ELECTRICITY DEPARTMENT

CHARGE ENGINEERS, Permanent Staff, required for shift duties in the Singapore Power Station. Present capacity, 37,000 kW, with proposed extensions to 87,000 kW.

Experience of extra high-tension 3-phase generation in a modern high-pressure steam power station is essential. Appointment subject to medical examination.

Basic salary scale, $440-$970 per month. Starting point according to qualifications and experience. Graduated scale of allowances, e.g., present allowance on $560 p.m. basic salary amounts to: Expatriation $110 p.m., plus cost of living $192 p.m. for single man or $246 p.m. for married man, or $318 p.m. for married man with family. Annual increments, $30 p.m. Local taxation much lower than in England. One Straits dollar equals 2s. 4d. Thus a married man with family on basic salary of $560 would draw equivalent of £1,383 sterling per annum.

Quarters, with heavy furniture, provided at 8 per cent. of salary or housing allowance up to 12 per cent. in lieu. Initial engagement on three years' agreement; eight months' leave after four years' service. Free medical attention. Passages paid, including family. Compulsory provident fund contribution, 7½ per cent. of salary, and Municipal Commissioners donate 7½ per cent. for first 10 years, rising to 20 per cent. after 20 years' service.

Applications, in duplicate, with full personal and technical information and copies of three testimonials to Messrs. Peirce and Williams (agents to the Municipal Commissioners), 1 Victoria Street, London, S.W.1. (G 661)

BRITISH ELECTRICITY AUTHORITY

South Western Division

EFFICIENCY ENGINEER
PORTISHEAD POWER STATION

APPLICATIONS are invited for the position of Efficiency Engineer at Portishead Power Station.

Negotiations for the appropriate grading within the National Joint Board Agreement concluded on February 17, 1950, are already proceeding. Pending the publication of the appropriate grade, the post will be provisionally graded in accordance with Class "L", Grade 7, of the National Joint Board Agreement dated September 4, 1947. The provisional salary for the appointment will, therefore, be £691 to £722 per annum.

The classification of Portishead Power Station in accordance with the present N.J.B. Agreement is "J".

Candidates should have had a good technical education and should be experienced in the operation of a modern power station equipped with chain grate stokers. They should be familiar with heat flow, boiler and turbine testing, and compilation of statistical data, and all matters appertaining to economical operation of a power station. A knowledge of the chemistry of combustion is desirable.

The appointment will be subject to superannuation in accordance with the British Electricity Authority and Area Boards' Superannuation Scheme.

Applications stating age, qualifications, experience and present position and salary should be addressed to the Divisional Secretary, British Electricity Authority, South Western Division, British Electricity House, 26 Oakfield Road, Bristol 8, so as to be received not later than December 1, 1950.

R. C. BARRETT,
Divisional Secretary.
November 13, 1950. (G 704)

BRITISH ELECTRICITY AUTHORITY

South Western Division

ASSISTANT SHIFT CHARGE ENGINEER
NEWTON ABBOT POWER STATION

APPLICATIONS are invited for the position of Assistant Shift Charge Engineer at Newton Abbot Power Station. Applicants should have good technical qualifications and a sound knowledge of the operation and maintenance of generating plant.

Salary and conditions of service will be in accordance with the National Joint Board Agreement, Class "F" Grade 9, £538 to £560 per annum.

The appointment will be superannuable in accordance with the British Electricity Authority and Area Boards' Superannuation Scheme.

Applications stating age, qualifications, experience, present appointment and salary should be addressed to the Divisional Secretary, British Electricity Authority, South Western Division, British Electricity House, 26 Oakfield Road, Bristol 8, so as to be received not later than November 30, 1950.

R. C. BARRETT,
Divisional Secretary.
November 10, 1950. (G 695)

SOUTHERN ELECTRICITY BOARD

No. 4 (Bournemouth) Sub-Area

APPOINTMENT OF ELECTRICAL DEMONSTRATOR (FEMALE), LYNDHURST DISTRICT

QUALIFICATIONS: Applicants must be qualified to advise generally on the utilisation of electrical appliances, competent to give demonstrations of cooking and apparatus in service centres and in the homes of consumers and be able to assist in showroom duties generally.

Salary and Conditions: The salary will be within the range of £310 to £390 per annum. (Progress beyond £350 per annum is dependent on certificate of capability) in accordance with Grade 1 of the N.J.C. Salary Agreement, 1950. N.J.C. conditions of service. If eligible the successful applicant will, subject to certain conditions, be required to join the B.E.A. and Area Boards' Superannuation Scheme.

Applications: On the Board's official form obtainable from the Sub-Area Secretary, No. 1 Priory Road, Bournemouth, and endorsed "Electrical Demonstrator" in the top left-hand corner, must reach him not later than 14 days after the appearance of this advertisement.

F. W. KEMPTON,
Secretary.
(G 700)

LONDON ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments in the Architect's Section of the Chief Engineer's Department in Central London.

(a) ARCHITECTURAL ASSISTANTS. Commencing salary will be from £500 per annum, dependent upon qualifications and experience. Applicants should be studying for or have passed the Intermediate Examination of the R.I.B.A., be capable draughtsmen and have had several years' experience in an architect's office.

(b) DRAUGHTSMEN. Commencing salary will be from £350 per annum, dependent upon ability and experience. Applicants should be neat draughtsmen and preferably have had several years' experience in an architect's office.

The salaries for the above posts are provisional pending grading of the posts under the National Agreement of the appropriate negotiating body.

Application forms, obtainable from Establishments Officer, 46 New Broad Street, E.C.2, on receipt of an addressed foolscap envelope, to be returned duly completed not later than November 25, 1950. Please quote ref: EST/V/1042/T on envelope and all correspondence. (G 672)

BRITISH ELECTRICITY AUTHORITY

Southern Division

APPLICATIONS are invited for the position of ASSISTANT CHEMIST at Poole Generating Station.

The salary, which is provisional and subject to negotiation, will be in accordance with Grade 11, Class "H" of the National Joint Board's Schedule, at present £538-£558 per annum.

Applicants should have had practical experience of fuel, water, and oil testing appropriate to modern generating stations. A knowledge of boiler chemistry for high steam pressures and temperatures will be an advantage.

Preference will be given to candidates possessing a Higher National Certificate in chemistry or equivalent qualifications.

The appointment is superannuable and subject to a satisfactory medical examination.

Application forms may be obtained from the undersigned and must be returned by November 30, 1950.

P. D. A. OLIVER,
Divisional Secretary.
British Electricity House,
High Street, Portsmouth. (G 692)

SOUTH EASTERN ELECTRICITY BOARD

Lewes District

FIRST ASSISTANT DISTRICT ENGINEER

SALARY of £804 to £928 p.a. under Class "C," Grade 5, of the N.J.B. Schedule. Superannuation will be arranged. Applicants should have sound experience in design, construction and maintenance of H.V. and medium pressure overhead and underground transmission systems and sub-stations, and the preparation of system extension and reinforcement proposals. Applicants must possess Higher National Certificate and preferably be Corporate Members of the I.E.E. or equivalent. The appointment will involve standby duties.

Applications, giving two referees, must reach G. R. Lincoln, Esq., Lewes Manager, South Eastern Electricity Board, 80 High Street, Lewes, by November 27, 1950.

Purley District

SECOND ASSISTANT ENGINEER

Salary of £579 p.a. to £659 p.a., plus London weighting, under N.J.B. Schedule, Class "E," Grade 7. Superannuation will be arranged. Applicants should be suitably qualified and have experience in the design, construction and operation of single and 3-phase, E.H.V., H.V. and M.V. underground distribution systems and sub-stations, including fault location and the installation and maintenance of protective equipment.

Applications, giving two referees, must reach J. McAlister, Esq., B.Sc., A.M.I.E.E., Purley Manager, South Eastern Electricity Board, Electric House, High Street, Purley, by November 27, 1950.

A. L. BURNELL,
Secretary.

November, 1950. (G 634)

BRITISH ELECTRICITY AUTHORITY

South Western Division

STATION SHIFT CONTROL ENGINEER
FEEDER ROAD POWER STATION

APPLICATIONS are invited for the position of Station Shift Control Engineer at Feeder Road Power Station, Bristol. Applicants should possess good technical qualifications, and have had sound technical training and practical experience in the control and operation of steam generating plant and main switchgear.

Salary and conditions of service will be in accordance with the National Joint Board Agreement, Class "E", Grade 10, £483 to £502 per annum. The appointment will be superannuable in accordance with the British Electricity Authority and Area Boards' Superannuation Scheme.

Applications stating age, qualifications, experience, present appointment and salary should be addressed to the Divisional Secretary, British Electricity Authority, South Western Division, British Electricity House, 26 Oakfield Road, Bristol 8, so as to be received not later than December 4, 1950.

R. C. BARRETT,
Divisional Secretary.

November 13, 1950. (G 703)

SOUTHERN ELECTRICITY BOARD

No. 2 (Newbury) Sub-Area

APPOINTMENT OF SUB-AREA MANAGER

APPLICATIONS are invited for the post of Sub-Area Manager of No. 2 (Newbury) Sub-Area. The Sub-Area contains approximately 2,750 sq. miles and 232,584 consumers, with an annual consumption of 702,254,000 units and a maximum demand of 207·9 MW.

The person appointed will be required to serve under the present retiring Sub-Area Manager from July 1, 1951, until January 31, 1952, on which date he will be required to assume the full duties and responsibilities of Manager of the Sub-Area. Candidates should have experience in the management of a large rural undertaking.

The salary as Sub-Area Manager Designate, payable from July 1, 1951, will be £2,000 per annum. As from February 1, 1952, the salary will be a provisional figure within the range £2,000-£2,500, and will be subject to negotiation by the appropriate body. The appointment will be subject to the conditions of service laid down from time to time by the Board, including a provision for three months' notice of termination by either side.

The successful candidate will, if eligible, be required to contribute to the B.E.A. and Area Boards' Superannuation Scheme.

Applications should be made on the form to be obtained from the undersigned, and should reach the Secretary at Southern Electricity House, Littlewick Green, Maidenhead, Berks, not later than December 7, 1950.

F. W. KEMPTON,
Secretary.
(G 693)

BOX No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London W.C.2

CITY AND COUNTY BOROUGH OF BELFAST

Electricity Department

APPLICATIONS are invited for the position of TURBINE ROOM MAINTENANCE ENGINEER (MECHANICAL). Applicants must have a University degree or the Higher National Certificate in Mechanical Engineering or be Corporate Members of the Institution of Mechanical Engineers, and should have workshop training, preferably with a manufacturer of large turbines, and extensive experience in a responsible position in the erection, maintenance and testing of steam-driven turbines and mechanical auxiliary plant appertaining to a large modern power station.

The salary for the position is in accordance with Grade 6 Class "G", of the Northern Ireland Joint Board Schedule of Salaries for Technical Engineers on the staff of authorised undertakers. The scale at present is £707 per annum for the first two years, £722 for the third and fourth years, and £737 after the fourth year. Preference will be given to ex-Service candidates possessing the required qualifications.

Applications, which must be made on the official forms obtainable from the City Electrical Engineer and General Manager, Electricity Department, East Bridge Street, Belfast, with copies of not more than three recent testimonials, must be posted or delivered so as to be received by the Town Clerk not later than 4 p.m. on Friday, December 1, 1950.

Canvassing in any form, oral or written, direct or indirect, will, if proved to the satisfaction of the appointing authority, disqualify a candidate for appointment.

JOHN DUNLOP,
Town Clerk.

City Hall, Belfast. (G 697)

BRITISH ELECTRICITY AUTHORITY

East Midlands Division

SECOND ASSISTANT ENGINEER (MAINTENANCE) IN THE TRANSMISSION DEPARTMENT AT DIVISIONAL HEADQUARTERS

APPLICATIONS are invited for the position of 2nd Assistant Engineer (Maintenance) in the Transmission Department at this Divisional Headquarters.

Applicants should have received a first-class technical education and should be Corporate Members or Graduates of the Institution of Electrical Engineers and have had considerable experience in the maintenance and operation of 132 kV transmission systems together with sub-stations and associated equipment.

The salary for this appointment will be in accordance with Grade 2, Schedule "C" of the National Joint Board Agreement, £752-£966 per annum and will commence at a point commensurate with qualifications and experience.

Application forms may be obtained from the Divisional Establishments Officer, British Electricity Authority, Barker Gate, Nottingham, and should be returned not later than December 5, 1950.

W. S. BURGE,
Divisional Controller.

British Electricity House,
Barker Gate, Nottingham. (G 693)

SOUTH EAST SCOTLAND ELECTRICITY BOARD

Fife Sub-Area

COMMERCIAL ASSISTANT (Refrigeration, Sales and Service) at Sub-Area Office, Dunfermline, with experience of the installation and servicing of Commercial and Domestic Refrigerating Equipment. Knowledge of Electrical Contracting and the Servicing of other Electrical Apparatus would be an advantage. The salary for the post will be in accordance with Grade 3 of the National Joint Council (Administrative and Clerical Grades for the Electricity Supply Industry) £450/£510 per annum. The appointment is superannuable. Applications giving details of training, qualifications, experience, present appointment, and stating whether married or single, to: South East Scotland Electricity Board, East Port, Dunfermline. (G 642)

A RECENTLY opened drawing office at Bradford requires additional DRAUGHTSMEN for work on electrical control gear. Draughtsmen with previous electrical or mechanical experience are invited to apply for these posts which are permanent, progressive and pensionable.—Please write, quoting Reference 138A, to Central Personnel Service, English Electric Company Limited, 24/30 Gillingham Street, London, S.W.1. (G 606)

ARMATURE WINDER to take charge of winding shop. Must be fully experienced in armature and stator winding and able to train labour. Good flat available to right man.—Box No. 1925, Electrical Times. (G 705)

ASSISTANT DESIGNER required by an established firm of industrial motor manufacturers. Applicants having design experience of a.c. and d.c. motors, generators and alternators, covering outputs up to approx. 200 h.p., should reply stating age, experience, qualifications and salary expected to: Box No. 1827, Electrical Times. (G 498)

CONTROL ENGINEERS

CONTROL ENGINEERS for network operation required by Major Oil Company in Middle East for control centre covering operation of extensive overhead and underground transmission and distribution networks up to 66 kV. Applicants must possess Ordinary or Higher National Certificate in Electrical Engineering, and must be experienced in the operation of indoor and outdoor metal-clad switchgear at all voltages, transformers and associated substation equipment. Age not over 35. Attractive salary, plus generous allowance in local currency, free passages out and home, free medical attention, kit allowance, good leave arrangements, Pension Scheme.—Write, giving personal particulars and details of qualifications and experience, quoting:

DEPARTMENT F.116 TO BOX NO. 2584 AT 191 GRESHAM HOUSE, E.C.2. (E 369p)

CABLE ENGINEER with experience in supervising cable laying and power station contracts, up to 33 kV. Must be willing to work in any part of U.K.—Apply in writing, stating age, experience and salary expected, to Managing Director, Scottish Cables Ltd., Renfrew. (G 686)

CABLE JOINTERS for work on 33 kV installations required immediately. Must be prepared to work in any part of the U.K. Apply, stating age and giving details of experience to Box No. 1843, Electrical Times. (G 532)

CAPABLE ENGINEER to handle development and sales of device associated with motor control gear. Experience of traction and industrial motor control gear design essential. Age 30-35. Salary £700 per annum.—Full particulars to Box No. 1863, Electrical Times. (G 568)

CIVIL Engineering Contractors in Liverpool (Kirkby) require DRAUGHTSMEN for arrangements of electrical equipment. Mechanical or electrical experience suitable, but not essential. Age 20/25. Salary according to age and ability.—Apply in writing to Staff Officer, B.I.C.C., Ltd., Prescot, Lancs. (G 664)

DRAUGHTSMAN (ELECTRICAL) required for Iron and Steel Works.—Applications, giving age, details of education and experience, with dates, should be submitted, together with salary required, to the Chief Engineer, Workington Iron and Steel Company, Moss Bay, Workington. (G 549)

DRAUGHTSMAN (Electrical) to prepare under supervision single line diagrams, factory lighting and power layouts. Excellent canteen available. Five days week.—Write, Staff Manager, giving age, details of experience, salary required to: U.D. Engineering Co. Ltd., Cumberland Avenue, Park Royal, N.W.10. (G 709)

ELECTRICAL DRAUGHTSMAN required by major oil company for service in the Middle East. Must have served five years electrical engineering apprenticeship, and have had five years D.O. experience in connection with electrical layouts of large industrial plants with underground cable networks. Should possess Higher National Certificate. Graduate or associate membership of a corporate engineering body desirable but not essential. Maximum age limit 35 years. Attractive salary plus generous allowance in local currency. Free passages out and home, free medical attention, kit allowance, good leave arrangements. Pension scheme.—Write, giving personal particulars and details of qualifications and experience, quoting Dept. F.192, to Box No. 2609, at 191 Gresham House, Old Broad Street, E.C.2. Applicants without above requirements will not be considered. (F 322)

ELECTRICAL ENGINEERS required for service in Middle East. Applicants should (a) possess Ordinary or Higher National Certificate and have had full apprenticeship with heavy electrical equipment manufacturers or with a large colliery or allied fully electrified industry, or (b) possess a degree and have had two years' technical apprenticeship with similar firm to above. In each case applicants must have had at least three years' subsequent experience on the installation and maintenance of heavy electrical equipment. Maximum age limit 35 years. Attractive salary, plus generous allowance in local currency, free passages out and home, free medical attention, kit allowance, good leave arrangements. Pension scheme.—Write, giving particulars and details of qualifications and experience, quoting Dept. F.191, to Box No. 2916 at 191 Gresham House, E.C.2. (G 19)

ENGINEERS required for STEAM TURBINE DESIGN DEPARTMENT of large manufacturer in the Midlands. Candidates should have technical qualifications up to Higher National standard, preferably with shop and drawing office training.—Write Box No. 1907, Electrical Times. (G 666)

EXPERIENCED CLERK required for Electrical Contractors, Westminster, on pricing and accounts.—Box No. 1913, Electrical Times. (G 669)

EXPERIENCED ENGINEERS accustomed to the erection of lattice tower, concrete and wood pole overhead transmission lines and willing to serve either at home or overseas, age 25/45.—Apply, in writing, giving full details, to the Staff Officer, British Insulated Callender's Construction Company, Limited, 21 Bloomsbury Street, London W.C.1. (G 708)

FULLY qualified POWER HOUSE ENGINEER required to take charge of modern boiler plant with pass-out turbines supplying steam and electricity to large industrial plant. Applicants should have previous power house experience and be able to conduct own maintenance and will be directly responsible to Chief Engineer. Salary according to qualifications and experience. Pension scheme.—Applications, giving age, qualifications, and experience, to Personnel Manager, British Enka Ltd., Aintree, Liverpool 9. (G 687)

JUNIOR TEST ENGINEER for high voltage testing work. Age 20-25 years. Technical education to at least Ordinary National Certificate standard. Previous electrical testing experience necessary.—Write for interview, giving training and experience to: Box No. 1927, Electrical Times. (G 706)

K.L.G. Sparking Plugs Ltd., require a TECHNICAL ASSISTANT with National Certificate or equivalent qualifications for their Engineering Department for development work and providing technical assistance to factory production in connection with thermocouples and temperature measurements generally. Some experience in electrical measurements desirable.—Apply, giving details of qualifications and experience to Commercial Manager, Putney Vale, S.W.15. (G 590)

LIFT DRAUGHTSMEN, senior and junior for layout and for mechanical and electrical equipment departments. Good prospects for advancement. South Midland area. 40-hour, five-day week. Salary according to age and qualifications.—Box No. 1921, Electrical Times. (G 634)

NELSON Research Laboratories, English Electric Co. Ltd., Stafford, have vacancies for men with Higher National Certificate (Electrical) for design and development work on small transformers and other allied iron core devices. Work will include the study of behaviour of transformers, etc., under transient and steady a.c. conditions. Experience in this field desirable but not essential. Salary according to qualifications. Apply stating age, qualifications and experience mentioning ref. 823, to Central Personnel Services, English Electric Co., Ltd., 24-30 Gillingham Street, London S.W.1. (G 652)

PLANNING ENGINEER, ELECTRICAL. An Assistant Electrical Engineer for planned maintenance programmes is required by large manufacturing company in the South West of England. Applicants, between 25 and 35, must (a), have had at least 5 years maintenance experience and have obtained at least National Certificate in Electrical Engineering or (b), have served an apprenticeship with subsequent experience and have either degree qualifications or a Higher National Certificate. Commencing salary in the range of £400 to £500 per annum.—Reply, in first instance, giving brief details and quoting ET/EPE to Box No. 1919, Electrical Times. (G 680)

QUALIFIED ELECTRICAL ENGINEER with experience in the design and development of servo and electromagnetic equipment for aircraft, will find interesting work and a progressive position in a rapidly expanding company.—Apply, stating age, details of experience and salary required, to Mr. G. Orloff, Chief Designer, British Messier Ltd., Cheltenham Road East, Gloucester. (G 608)

SENIOR DEVELOPMENT DRAUGHTSMAN required for oil circuit breakers and switchgear up to 11 kV, and general switchgear development, by old-established firm in the Manchester district. Salary commensurate with ability.—Full details of experience, technical education and salary required, to Box No. 1889, Electrical Times. (G 623)

SENIOR DRAUGHTSMEN-DESIGNERS with sound basic training and experience in either (1) structural design, steel or R.C.; (2) electrical plant layout, e.h.t. switchgear and cabling in connection with power stations and outdoor substations. London office, pension fund, salary according to experience. State age and salary requirements and Ref. 22/6.—Box No. 131, c/o Walter Judd Ltd., 47 Gresham Street, E.C.2. (G 605)

STRUCTURAL DESIGNERS AND DESIGNER-DRAUGHTSMEN with experience in light steel structures required for work in London office in connection with radio masts and towers.—Apply, stating age, qualifications, experience and salary required to the Staff Officer, British Insulated Callender's Construction Company, Limited, 21 Bloomsbury Street, London, W.C.1. (G 375)

TECHNICAL ENGINEER required by electric control gear manufacturers in London. Must have sound electrical knowledge, coupled with commercial experience. Reply, stating age, experience and salary required, to Box No. 1903, Electrical Times. (G 657)

SHIFT CHARGE ENGINEER for Electricity Supply Undertaking in Bagdad. Applications are invited from suitably qualified Engineers, preferably between 25 and 35 years of age, who have had experience in the operation of a power station of at least 15,000 kW with medium pressure boilers. Salary £1,000 to £1,200 per annum, plus high cost of living allowance, at present 18¾ per cent. with maximum of £300 p.a. Free house with heavy furniture will be supplied or a monthly house allowance of £12 in lieu.

Three year contract, renewable, with first-class passage each way for successful applicant and family (if married). Three months leave on full pay in U.K. on completion of 24 consecutive months in Iraq, first-class leave passages being paid.—Box No. 1911, Electrical Times. (G 668)

WANTED. Young ELECTRICAL ENGINEER, 24-30 years. Full apprenticeship and Grad. I.E.E. essential. Must be a reasonably good draughtsman. Good prospects for a young man with drive and initiative.—Full details to Box No. 1871, Electrical Times. (G 572)

YOUNG ELECTRICAL ENGINEER to H.N.C. standards, wanted for manufacturers of electro-mechanical apparatus in London.—Reply, stating age, experience and salary required, to Box No. 1905, Electrical Times. (G 658)

APPOINTMENTS WANTED

EXPERIENCED ELECTRICIAN, age 26, seeks permanent progressive employment in South or South-West England.—Box No. 1923, Electrical Times. (G 702)

WORK WANTED

A.C. and d.c. Motor Rewinds and Repairs. Prompt service, fully guaranteed.—Edgware 8631 (4 lines), Service Electric Co., Ltd., Stanmore, Middx. (D 324)

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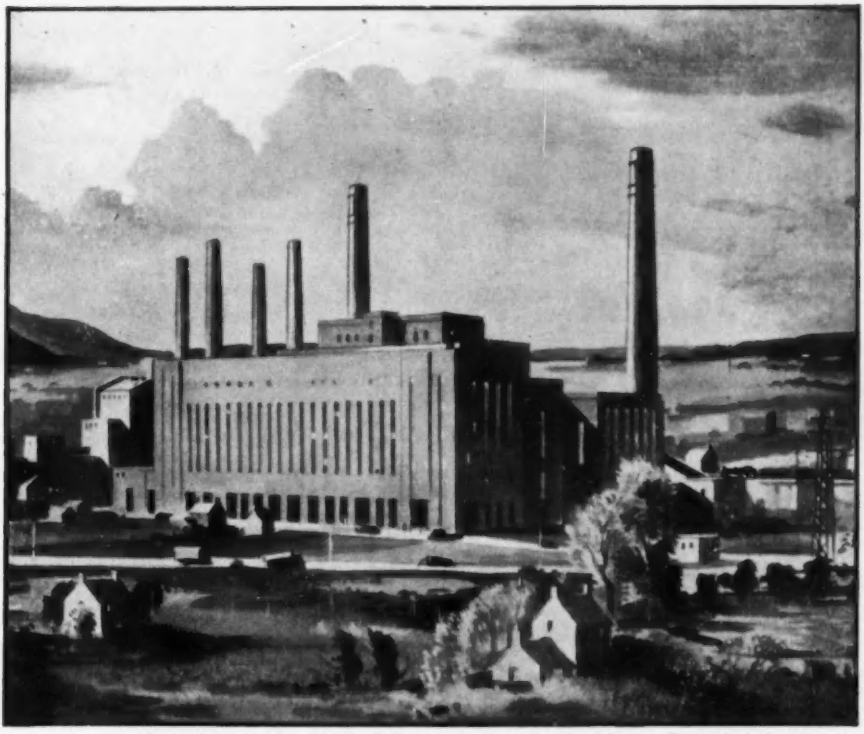

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INDEX TO ADVERTISERS

Aeraspray Manufacturing Co., Ltd. 86
Aerialite, Ltd. 89
Arrow Electric Switches, Ltd. ... 54
Automatic Telephone and Electric Co., Ltd. 39

Baume (Heuer) Ltd. 76
Belling and Co., Ltd. 6
Berry Wiggins and Co., Ltd. ... 82
Bill Switchgear, Ltd. 5
Birch, H. A., and Co., Ltd. ... 11
British Electric Authority 69
British Insulated Callender's Cables, Ltd. 1
British National Electrics, Ltd.... 2
British Thomson-Houston Co., Ltd. 30
Brush Electrical Engineering Co., Ltd. 53

Carron Company 13
Carter, B. and F. Co., Ltd. ... 70
Chamberlain and Hookham, Ltd. 37
Cole, E. K., Ltd. 18
Columbus, Ltd. 44
Contactor Switchgear, Ltd. ... 73
Crabtree, J. A. and Co., Ltd. ... 27
Cressall Manufacturing Co., Ltd. 4
Crompton Parkinson, Ltd. 17, 20

Daleman, Richard, Ltd. 86
Daly (Condensers) Ltd. 68
Dexion, Ltd. 83
Dorman and Smith, Ltd. ... 90
Drake and Gorham Wholesale, Ltd. 18
Duratube and Wire, Ltd. ... 49

Electric Construction Co., Ltd.... 10
Electropower Gears, Ltd. ... 78
Elliott Bros. (London) Ltd. ... 75
Engineering & Lighting Equipment Co., Ltd. 21

Erskine, "Heap" & Co., Ltd. ... 14
Everett Edgcumbe, Ltd. ... 85
Evershed & Vignoles, Ltd. ... 41

Ferguson Pailin, Ltd. 7
Ferranti, Ltd. 15
Fry's Metal Foundries, Ltd. ... 56

Geipel, William, Ltd., ... 84
General Cable Manufacturing Co., Ltd. 12
General Electric Co., Ltd. 33, 77
G.W.B. Electric Furnaces, Ltd.... 4

Hackbridge & Hewittic Electric Co., Ltd. 81
Hague & McKenzie, Ltd. ... 36
Henley's W.T. Telegraph Works Co., Ltd. 59
Holophane, Ltd. 26
Hoover, Ltd. 58

Ingram, Kemp & Joyner ... 42
International Refrigerator Co., Ltd. 34

Jackson Electric Stove Co., Ltd. 25
Johnson & Phillips, Ltd. ... 9

Kempston Electrical Co., Ltd. ... 86

Laing, John, & Son, Ltd. ... 87
Laurence, Scott & Electromotors, Ltd. 3
Legg (Industries), Ltd. 74
Lindley Thompson Transformer and Service Co., Ltd. 28
Liverpool Electric Cable Co., Ltd. 22

M.K. Electric, Ltd. 32
Marbourn, Ltd. 78
Mersey Cable Works, Ltd. ... 29
Metafiltration Co., Ltd. 80
Metropolitan-Vickers Electrical Co., Ltd. 35, 60
Metway Electrical Industries, Ltd. 4
Midland Electric Manufacturing Co., Ltd. 19

Nevelin Electric Co., Ltd. ... 90
New Day Electrical Accessories, Ltd. 72

Parsons, C. A., & Co., Ltd. ... 47
Premier Electric Heaters, Ltd.... 71
Pritchet & Gold & E.P.S. Co., Ltd. 23

Revo Electric Co., Ltd. 88
Reyrolle, A., & Co., Ltd. ... 24
Rotunda, Ltd. 82
Rowlands Electrical Accessories, Ltd. 31

Salter, George, & Co., Ltd. ... 46
Sanders, William, & Co. (Wednesbury), Ltd. 51
Scemco, Ltd. 84
Service Electric Co., Ltd. ... 74
Siemens Brothers & Co., Ltd. ... 55
Simmonds & Stokes, Ltd. ... 76
Simplex Electric Co., Ltd. ... 45
Simon-Carves, Ltd. 16
S.N. Engineering Co., Ltd. ... 86
St. Helens Cable & Rubber Co., Ltd. 36
Standard Telephone & Cables, Ltd. 52
Statter, J. G., & Co., Ltd. ... 84
Steatite & Porcelain Products, Ltd. 8
Stirling Boiler Co., Ltd. ... 48
Sturdy Electric Co., Ltd. ... 86
Superheater Co., Ltd. 78

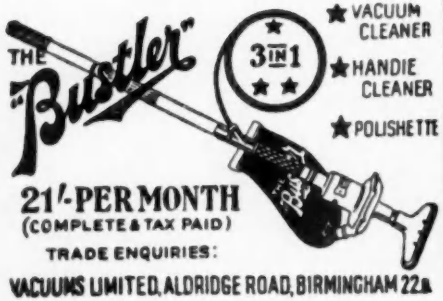
Taylor Tunnicliff & Co., Ltd. ... 50
Telegraph Construction & Maintenance Co., Ltd. 40
Thorn Electrical Industries, Ltd. 79
Tilling-Stevens, Ltd. 80
Tucker, J. H., & Co., Ltd. ... 38

U.S. Metallic Packing Co., Ltd.... 84

Vacuums, Ltd. 70

Ward, Thomas, W., Ltd. ... 72
Whiteley, B. S. & W., Ltd. ... 43
Wilkes, John, Sons & Mapplebeck, Ltd. 42

Zenith Electric Co., Ltd. ... 18



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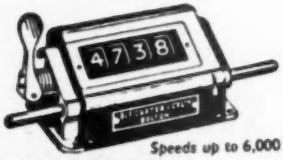

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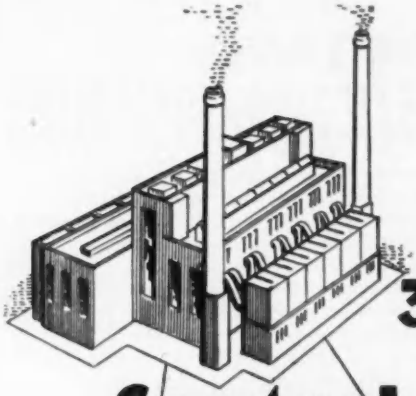

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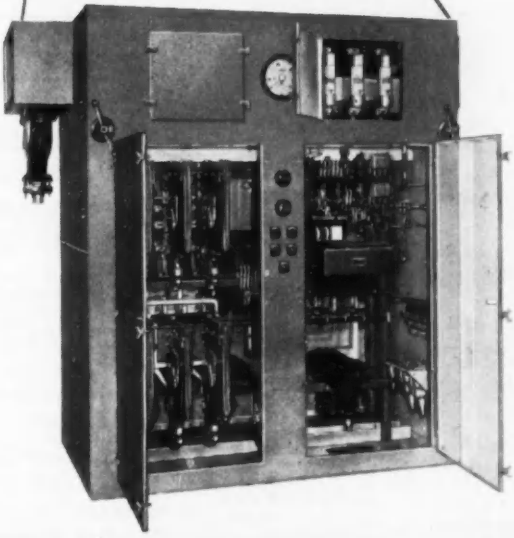

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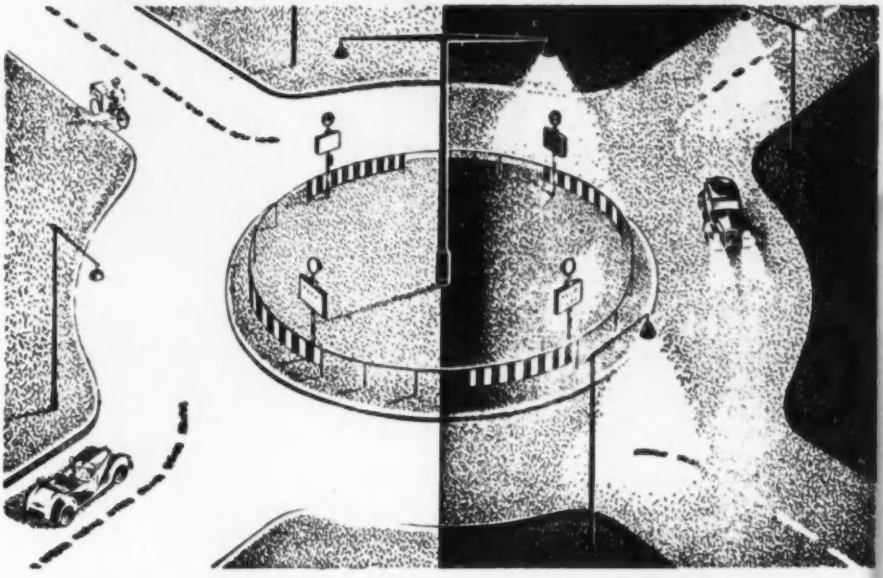

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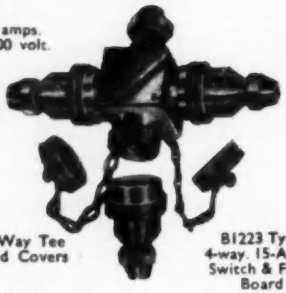

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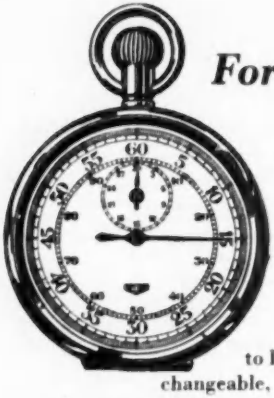

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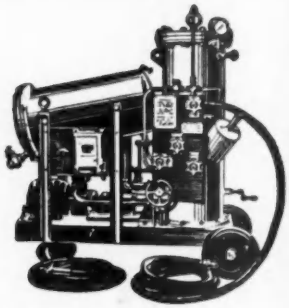

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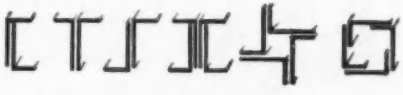

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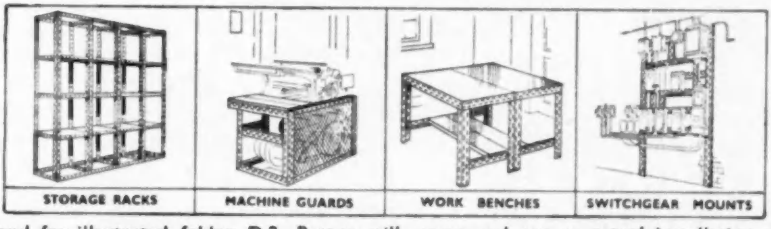

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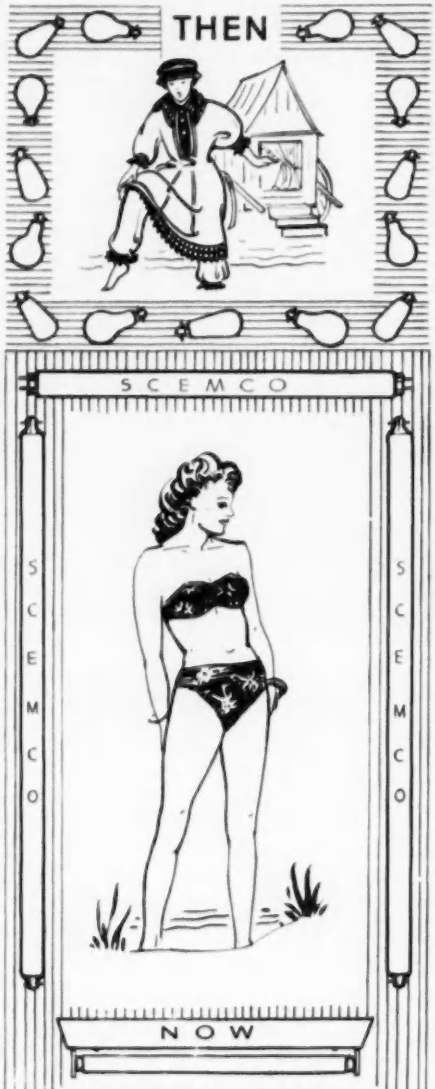

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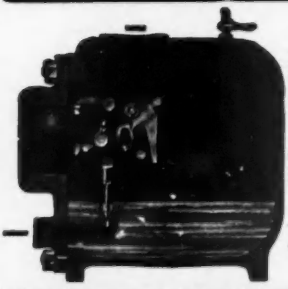

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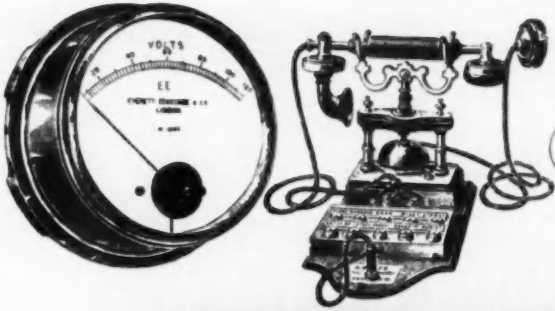

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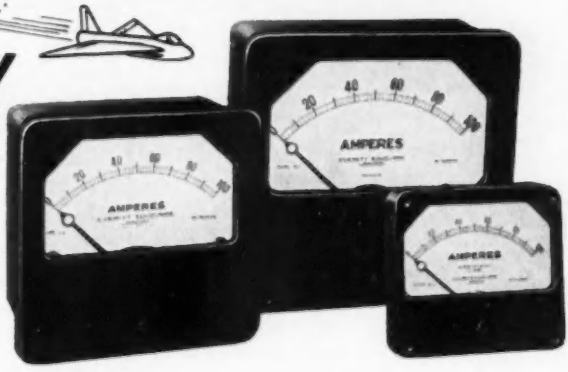

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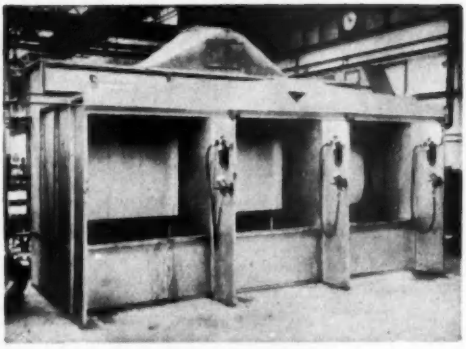

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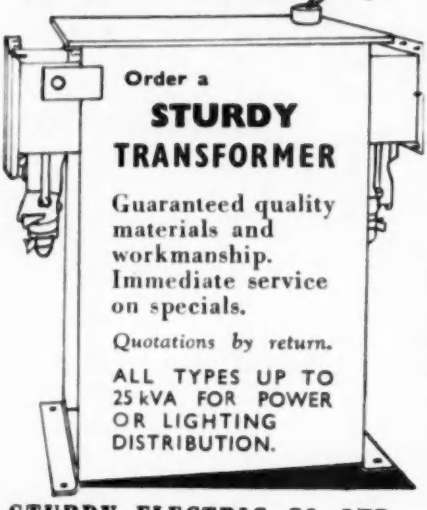

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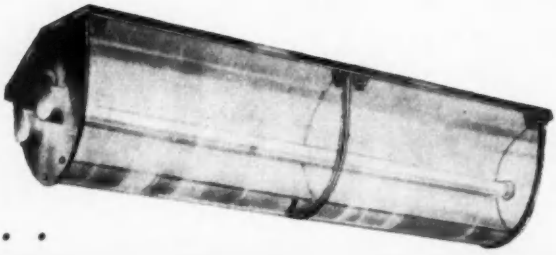

The above photograph shows Guildford 'bus station by night. The desirability for such a situation to be well illuminated is obvious, and our illustration can only do partial justice to the excellent results obtained from Revo (3-lamp) "Sol-etern" lanterns mounted on Revo "Regent" columns which form this installation. "Sol-etern" lanterns are made with 2, 3 or 4, 80w. fluorescent lamps for Group A roads; and with 2, 20w. or 2, 40w. lamps for Group B roads.

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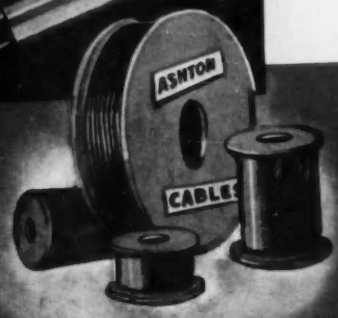

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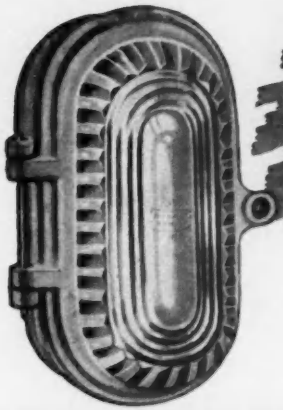
AERIALITE LTD, STALYBRIDGE, CHESHIRE



Maximum Lighting...

AT MINIMUM COST

DORMAN DIOLUX

60W. AND 100W.

- ★ New silicon alloy die cast case to BSS. 1490.
- ★ Internal fixing at brick width.
- ★ Scientifically designed prisms ensure light at all angles.
- ★ Two sizes — 60W and 100W.
- ★ Can be mounted on BS conduit box at almost any angle.

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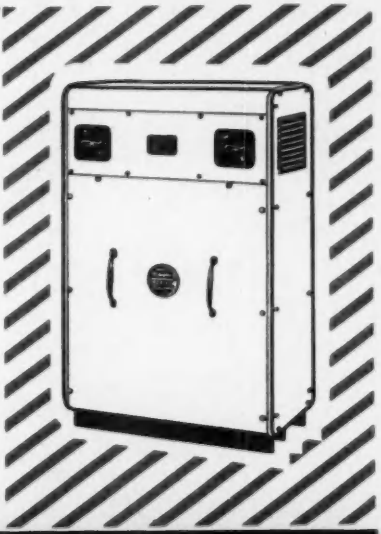
- ★ LOW MAINTENANCE COST
- ★ COMPLETE RELIABILITY
- ★ STATIC OPERATION
- ★ LOW INSTALLATION COST

and

- ★ PROMPT DELIVERY



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